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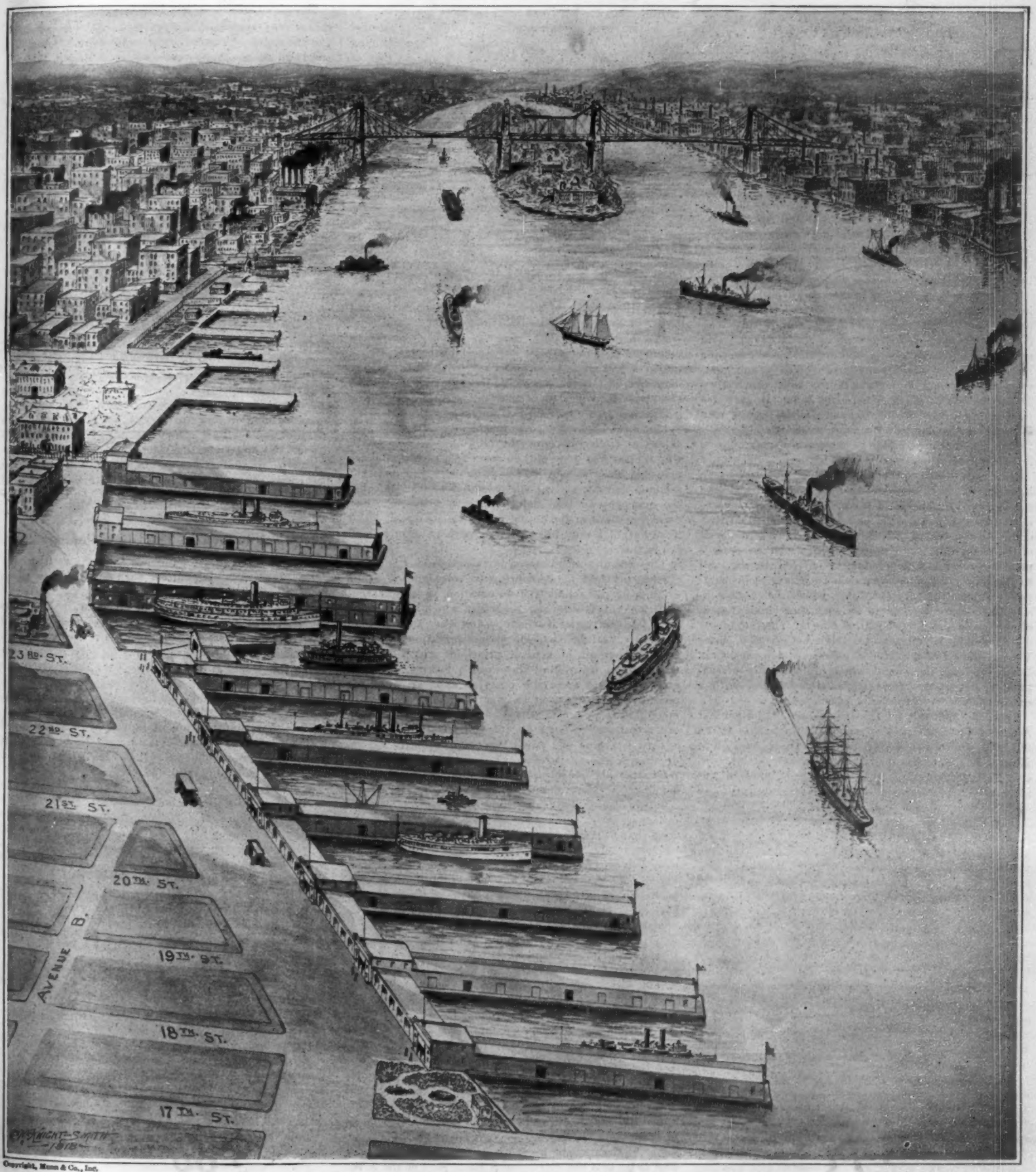

Proposed Sound steamer terminal on the East River, New York [See page 401]

SCIENTIFIC AMERICAN

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

The Hughes Aircraft Report

THE publication of the report of Judge Hughes on the aircraft situation brings to mind the report of the Senate Committee on the same subject, which appeared last August. Both the spirit and the content of that report were so extravagantly and hostilely critical that it failed to command the confidence of the American people. The Hughes report, on the contrary, is marked by the fairness and judicial impartiality which invariably distinguish the reports of Judge Hughes.

It is doubtful if there was ever before a government investigation that was so protracted and searching as this. The investigation lasted for twenty-two weeks, in the course of which two hundred and fifty witnesses were examined, and what they had to tell was set down in seventeen thousand pages of testimony.

Contrary to a rather widely extended expectation, the investigation failed to reveal any evidence of misappropriation of funds and, we are glad to note, although it is no more then we expected, that Mr. Howard Coffin and his immediate associates are accused of nothing more serious than a failure to measure up to the enormous scale and inherent difficulties of the task which they had undertaken. Such censure as Judge Hughes has to make is directed mainly against Colonel Deeds, who is recommended for trial by court martial, and he calls for the criminal prosecution of three other army officers, including Colonel Vincent.

Now with regard to the last named, it should be borne in mind, first, that the offense is a technical one and does not involve any charge of misappropriation of Government funds or connivance at schemes designed to that end. As a matter of fact, Colonel Vincent was an official of the Packard Motor Company (with which the government has contracts) long before we entered the war, and to this officer, for many years chief engineer of his company, we owe the Liberty Motor, which is the one conspicuous success recognized as such, here and abroad, of our whole aircraft production effort. These are facts which should be allowed to weigh heavily if Colonel Vincent should be tried for his offense, which consists in having violated the section which prohibits any government representative from transacting business with a corporation with which he is associated.

It will be remembered that the Senate Report of last August made much of the "waste" of the sum of $691,801,806, appropriated for aircraft production. The Hughes Report shows that up to June 30th of this year, only $430,234,316 was actually spent, and that of this some $155,535,946 went for airplanes and engines, and over $25,600,000 were spent abroad.

The Report shows that up to June 30th of this year, 6,171 planes and 12,633 engines had been delivered, but the letter of Attorney General Gregory, transmitting the report, brings the totals to October 11th, the respective figures being raised to 9,674 planes and 24,672 engines. Also 3,129 planes complete with engines were obtained abroad.

Regarding the Liberty Motor, the report shows that up to the end of June, 1,615 twelve-cylinder motors were produced for the Army and 775 for the Navy. Since the date of the report, however, this country has been getting into its full stride, and John D. Ryan, director of airplane production, states that 4,000 Liberty twelve-cylinder engines were turned out in the single month of October, and that the fighting-plane production is assuming gratifying proportions. In this connection, it should be noted that contracts for 22,500 Liberty motors went to the following companies: 6,000 each to the Lincoln Motor Company and the Packard Motor Company; 5,000 to the Ford Motor Company; 3,000 to the Nordyke and Marmon Company; 2,000 to the General Motors Corporation; and 500 to the Trego Motor Company. We have 4,572 training planes, 1,046 advanced training planes, and 553 combat and bombing planes. Says the report: "We have not as yet, October 25th, sent from this country to the battle front a single pursuit or combat plane, and after giving due weight to all explanations, the fact remains that such pursuit planes could have been produced in large quantities many months ago, had there been prompt decision and consistent purpose."

We are told that the Liberty Motor is a great success for observation and bombing planes, but is too heavy for the lighter pursuit planes. We tried our hand at the Spads but abandoned them; the Bristol fighter was a failure; and according to the report, there is nothing of last Fall's program for service planes save the "De Haviland 4s."

The Havilands are the redeeming feature so far as fighting planes are concerned. They are fast and efficient and we are now turning them out in large numbers.

In conclusion, we can only repeat what we have already said in these columns; that there has been from the very first too much exaggerated publicity in the matter of aircraft production. That perfect orgy of press exploitation of Government work, or rather of Government promises, which marked the first six months of our entrance into the war, was nowhere more active than in connection with aircraft production. The only parallel is to be found in the confident statement of the Shipping Board, that we were going to build six million tons of shipping within the twelve months. We were altogether too self-conscious in this matter, too eager to be original and distinctively American. The spirit has cost us dear; for instead of adopting the very best that Europe could give us in the emergency, we set about, in spite of our inexperience, to show them that the things which France, Great Britain and Italy had done, we could do much better here than they had done there.

However, the faulty organization, the confusion in execution, the inefficiency, the delay in executing plans, are a matter of history; and it is for the country to profit by its mistakes and bend itself with every energy to catching up with the demands of our rapidly increasing army.

A Study in Cause and Effect

THE province of history is twofold—to record and to interpret. In discharging the first function, there can be no material dispute, no grave difference of opinion, between honest historians. Facts are facts, and are to be recorded only with truth, as they happened, or falsely, as they did not happen. But when the historian comes to perform his second duty, he is confronted with a task far less simple and direct.

Historical interpretation means the discussion of causes and effects. Now the only person who *knows* why a deed was done is the doer. Others can advance plausible theories why it was done, can say on what grounds they themselves might have done it. But only the man who actually did it can give a complete and correct account of the actual reason for its doing. And if he be not keenly introspective, perhaps even he will fail in this.

The difficulty encountered in tracing causes is multiplied many fold in attempting to trace effects. Like division to the child and integration to the mathematician, this is a reverse process in which the way has to be felt slowly and haltingly. And when the historian comes to the larger aspects of interpretation, when he constructs a set of general principles which he may postulate as controlling the world's history, when he extracts lessons from the past for application to the present, we must expect the very widest divergence of opinion. Some historians will preach democracy, others autocracy; some are for centralization and some against it; some will stress the contribution of the individual to the affairs of nation and of race, others will insist that the great man is but a product and an incident of his times; and so on, *ad libitum*.

Furthermore, like everything else, history exhibits fashions. Now one school is "in," now another; the style changes, not from year to year, but from generation to generation; today one point of view is the generally accepted one, tomorrow another. And it goes without saying that the outlook of any generation upon its own history in the making is at least influenced, if not actually controlled, by the particular school of history in ascendancy at the time.

In this connection, we find it of the utmost significance to examine the historical tenets of the generation that grew up and assumed command of the field during the period 1890 to 1910. If this school were to be described in a single word, that word would be "materialistic." Its rise is sufficiently easy to account for.

"The Origin of Species" appeared in 1859. The theories that it advanced took the intelligent world by storm. And, as usual, the pendulum swung too far; swung so far that all religion and morality and humanity were lost sight of by the enthusiastic advocates of the new creed, in their haste to arrive at consequences which did not at all necessarily flow from the doctrine of evolution. It was not enough that the Biblical account of Creation be proved a pretty myth, all religion had to go into the discard with the legend of the Seven Days; it was not enough that analogy and relation be shown between man and the beasts of field and forest, all distinction between us and them had to be thrown overboard. In the wild scramble to clear the decks for the new ideas, everything went, whether it was or was not in conflict with those ideas. The possibility of man having evolved morally and spiritually away from the beasts, as well as mentally and physically, was quite lost sight of. In the eye of late nineteenth century science, man was become but a super-beast.

The historian, to whom falls the task of generalizing as to human motives, stood out longer than many of his scientific colleagues; but eventually he was carried away like all the rest. He could see that the acts of the lower animals spring from the desire for preservation, for food, for shelter, or for reproduction. We shall not presume to guess to what extent the historians of the past three decades have deliberately reasoned from these premises, or to what extent they have been unconsciously influenced by the trend of current scientific thought. But we can clearly trace, from 1890 on, the ascendancy of the materialistic note in history, both as taught and as written.

The potency of mental and spiritual factors as ruling causes was systematically scouted. It was assumed, and the constant endeavor was to prove, that principles and ideas are powerless to move man to action, that the urge behind every deed must be the desire for enough of the necessities, the comforts and the luxuries of this world—or, if the individual be already possessed of a sufficiency, the desire for a superabundance. The Protestant Reformation was reduced to an economic phenomenon, the persistence of early Christianity to a business proposition, our own Civil War to an industrial conflict between the employers of paid labor and the owners of slaves. And where no amount of sophistry would conceal or minimize an outstanding case of action based on a great principle or a great idea, the actor was made the butt of a withering sarcasm.

The attitude just outlined is as false and as much to be avoided as would be the claim that economic motives fade to nothing when opposed by a principle or an idea. We know that they do not; we know the truth of the matter to be that in no case can we say what motives have ruled until we have carefully weighed all possible motives—and then we shall usually find a mixture of economic and spiritual motives to have been the moving cause. The school of history that controlled the thought of the late nineteenth and early twentieth centuries was characterized by persistent disregard of this balance between motives, by persistent emphasis upon the material and the selfish impulses. We have no space to discuss the matter further at the moment; but at another time we shall return to it, and point out some of the pernicious consequences of the distorted brand of philosophy that has been preached by the historians of the past generation.

Spanish Influenza—The Disease of Mystery

STRIKING in the pandemic proportions it usually assumes, and regarded with fear because of its frequently treacherous character, "Spanish" influenza (so called), known for centuries, still remains the disease of mystery. Physicians assure us that, in a mild and often unrecognized form, it is always with us. Why is it that it suddenly flares up into a huge conflagration, which spreads rapidly over the greater part of the globe?

What is the nature of the micro-organism causing the infection? The bacillus discovered by Pfeiffer in connection with the pandemic of 1893 is generally regarded with mistrust. In many typical cases this bacillus has been absent, and, conversely, it has been found in cases in no way resembling influenza.

Why, unlike other respiratory diseases which are mainly prevalent in winter and early spring, do epidemics of influenza so frequently occur in pleasant weather in summer?

What causes the epidemic to spread apparently regardless of the usual measures for controlling epidemics? Why, during the present outbreak was the disease far less prevalent in New York, where schools and theatres were allowed to remain open, than in Boston, Philadelphia, and Washington, where they were closed?

Why is the disease often of a very mild type, and at other times so rapidly fatal?

Why, unlike ordinary pneumonia, has this disease spared individuals at both extremes of life, affecting chiefly individuals in the prime of life?

What is the relation of the streptococcus and pneumococcus to the severe cases?

Is the disease primarily caused by a filterable virus? According to Paris dispatches Nicolle claims to have demonstrated that the disease is caused by an ultra-microscopic virus. Such viruses are so minute that they pass through the minute pores of unglazed porcelain filters, and hence are called "filterable viruses."

And, lastly, does one attack afford immunity or does it make the individual more susceptible?

These are some of the questions aroused by the present visitation of this disease of mystery.

Astronomy

Borrelly's Comet.—This comet was discovered, on its present periodic visit to our system, by M. Faye, director of the Observatory of Nice, who has made a special study of the comet and found it exactly in the position determined by his calculations, which took account of perturbations by Jupiter and Saturn. The date of perihelion passage is Nov. 16th, 1918.

Parallax of the Andromeda Nebula.—The latest attempt to determine the parallax of the Great Nebula in Andromeda is reported by A. van Maanen. Sixteen exposures ranging from twenty to thirty-five minutes were taken with the 60-inch reflector at Mt. Wilson. The measurements relate to a central condensation three to four seconds in diameter surrounded by a faint elliptical nebulosity. Nine comparison stars were used. The resulting parallax, +0.004 sec.±0.005 sec., agrees well with the result of Barnard's measurements with the 40-inch Yerkes refractor, which gave no evidence of a measurable parallax.

American Eclipse Instruments Returned from Russia.—The long awaited eclipse instruments and supplies of the Lick Observatory, which were sent to Russia for the solar eclipse of August 21st, 1914, have at last come back to the observatory, though too late for use in the American eclipse of last summer. Their return was originally deferred on account of war conditions, and they were stored for three years at the Poulkovo Observatory. They were started homeward by way of Siberia in August, 1917, but were held up four months at Vladivostok and three months at Kobe, finally reaching Mt. Hamilton, in substantially perfect order, August 21st, 1918. The same shipment included the eclipse instruments taken to Russia by Professor Todd, of Amherst.

The Difficulty of Seeing Markings on Mars has been much exaggerated, according to Prof. W. H. Pickering. He states that at his mountain observatory in Jamaica he has seen some of the coarser canals clearly with a 3-inch refractor—not glimpsed them for a second or two, but held them steadily as long as he chose to look at them. Surprisingly good work has been done on Mars by Dr. Lau, in Denmark, with an aperture of less than four inches. "It is probable," says Professor Pickering, "that nothing of importance has yet been discovered on Mars that cannot be well seen with a good 12-inch reflector, properly located." A very large aperture cannot be employed satisfactorily on planetary details except when the "seeing" is extremely good. On an average night more can be seen with an aperture of 12 inches than with one of 36 inches.

Early Observation of Nova Aquilae No. 3.—The astronomical journals of Europe and America are still publishing, from month to month, reports of early and independent observations of the nova that appeared in Aquila last June. According to a note by Dr. Aitken, of Lick Observatory, it seems probable that W. J. Luyten, of Deventer, Holland, saw the nova and suspected its character on the evening of June 6th, 1918. According to a Harvard College Observatory Circular, the first American observer was Mr. Vincent Francis, of New Bedford, Mass., who saw the star at 13 h. 00 m. Greenwich mean time, June 8th. Dr. Aitken calls attention to the curious psychological fact that several perfectly honest people claim to have discovered the nova at dates when, as shown by the photographic record at Harvard, such observations were physically impossible. Harvard College Observatory has published a preliminary light curve, from time of discovery to July 23d, based on 523 observations by 71 different observers. The fluctuations of brightness are similar to those in the light curve of Nova Persei No. 2.

Progress of the Henry Draper Catalog.—The Draper Catalog of stellar spectra, published in 1890, contained the classifications of the spectra of more than 10,000 stars; the work of Mrs. Fleming, of Harvard College Observatory. Subsequent volumes contained revisions and extensions of the work by Miss Maury and Miss Cannon, so that the whole presented fairly complete data of the spectra of all stars down to the sixth magnitude, besides many fainter stars. A more recent undertaking is the classification of the spectra of the great number of faint stars recorded on the original plates, several thousand in number, but not included in the earlier volumes. Within the short period of four years Miss Annie J. Cannon, with the aid of five assistants classified 242,093 spectra, relating to about 222,000 stars. The publication of the results is now in progress, the first of the nine large volumes which will be required for the Henry Draper Catalog, as the new work is called, having been issued by Harvard College Observatory in December, 1917. This volume gives data relating to 25,763 stars, included within the first four hours of right ascension; viz., catalog designations, positions for 1900, photometric and photographic magnitudes, and spectral classes. It will take about four years to complete publication. The faintest stars included are of the eleventh magnitude.

Science

Mr. Frank N. Meyer, the well-known agricultural explorer of the U. S. Department of Agriculture, met with accidental death in China on or about June 2d. He disappeared from a steamer on the Yangtze-Kiang and his body was recovered a week later. Mr. Meyer, who had been exploring in China, Siberia and Turkestan for about ten years, was responsible for the introduction of a great number of valuable plants into the United States. He discovered the origin of the chestnut-bark disease and of the blight-resistant species of chestnut in China.

Hibernation of the Malaria Germ.—A contribution to this question is made by E. Roubaud in the *Comptes Rendus*. The experiments described show that not only do the salivary glands of the marsh Anopheles mosquito lose their sporozoites after a comparatively small number of punctures, but that the sporozoites, if not ejected, slowly degenerate in the glands or in the saliva. Thus a prolonged conservation of the power of infection in infected Anopheles seems impossible, and the saliva of mosquitoes cannot be regarded as a hibernation medium of malarial germs.

Color-Blindness.—The importance of differentiating between those who are dangerously and permanently color blind as between red and green and those who are only slightly or temporarily so is brought out in Bulletin No. 92 of the United States Public Health Service. Those are recognized as dangerously color-blind who are (1) able to see less than four colors in the spectrum, (2) able to see more than three colors in the spectrum, but who have the red end so shortened as to fail to detect a red light at a distance of two miles, (3) those with an area in the field of vision that is partly or wholly blind to red and green. In separating such persons from those with normal color vision, it is suggested that the Eldridge-Green color lantern is preferable to the traditional colored yarns. An interesting feature of the investigation was the determination of the extent of color-blindness. It was found in some degree among 8.6 per cent of men and 2.2 per cent of women. To an extent which would become dangerous in a profession requiring the recognition of colored signal lights, it was found to exist in 3.1 per cent of men and 0.7 per cent of women.

The Scientific Survey of Porto Rico and the Virgin Islands by the New York Academy of Sciences, in cooperation with the American Museum of Natural History, the New York Botanical Garden, Columbia University and other institutions is throwing a flood of light upon the geology, palæontology, botany, zoology and anthropology of the islands in question. Publication of results has already begun. According to the last report of the Porto Rico Committee of the New York Academy some of the more notable achievements of this undertaking include the first discovery of Tertiary fossil plants in the West Indies, the discovery of a possible new family, a new genus and several new species of fossil mammals, valuable anthropometric data applicable to the planning of school work in Porto Rico, and voluminous folk-lore records, said to be more extensive than all hitherto published Spanish folk-lore literature, making possible, for the first time, a careful comparison between Spanish and other European folk-lore. Numerous well known specialists have been engaged in the various lines of work. The survey is partly supported by funds provided by the government of Porto Rico.

Variations in the Dip of the Horizon.—W. J. Peters, of the Carnegie Department of Terrestrial Magnetism, has recently published the results of extensive observations made during the cruises of the "Galilee" and the "Carnegie" on the variations in the dip of the horizon due to refraction. This subject has previously been investigated from time to time, especially by the Germans. An official German textbook of navigation states that the horizon has been observed as much as 15 minutes above and three minutes below its normal position. Bowditch's American Practical Navigator gives an even wider range. The subject is of practical importance, since each minute of abnormal refraction means an error of a mile in the determination of the ship's position. The observations described by Peters appear to have been taken with special care, and number no less than 3,031 determinations. In all of these measurements the horizon was never raised by refraction more than 2.4 minutes nor depressed more than 2.0 minutes below the position in which it would have been seen (*i. e.*, the normal dip, due to the elevation of the observer above the sea) if no refraction had existed. Most of the measurements were taken with a Pulfrich dip-of-the-horizon measurers made by Zeiss, of Jena. Mr. Peters thinks that the extraordinary values that have been occasionally reported may be peculiar to certain regions, where the navigator should be ready to detect them either by observing stars in different azimuths or by special instruments or attachments to the sextant. He adds that when aerial navigation across the oceans is realized, if astronomical methods of navigation are used, some simple means of measuring the dip of the horizon will become highly desirable.

Electricity

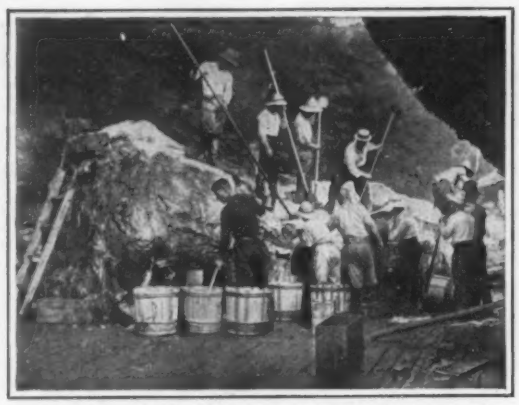
Electric Welding with Various Metals.—In a recent issue of the *Revue General de l'Electricite*, Mr. J. Guerner compares the various methods of uniting metals, such as soldering and brazing with electrical processes, comprising welding, mixed welding and resistance welding. The electrical methods are now giving promising results, but the best method of treatment varies according to the metals dealt with. Iron may be welded by almost any of the typical electrical welding processes, a number of which are described. Copper sometimes presents difficulties owing to its low resistance and high thermic conductivity; it has also the inconvenient quality of passing from the solid to the liquid state without any marked intermediate pasty condition. Aluminum is particularly difficult to weld owing to the tendency to form oxide layers, and requires special skill on the part of the workman. Experience has shown that the joint formed in electric arc welding is harder than the original metal; in resistance welding, on the other hand, there appears to be little difference. One interesting development is the filling up of small cracks in shell cases.

Air Raid Signals.—Some interesting particulars concerning the Challot rotating vanes and the series of horns forming the sirens now mounted on monuments in numerous French towns to give warning of the approach of hostile aircraft, are published in a recent issue of *Engineering*. The siren consists of a casing, or stator, within which an aluminum rotor revolves on ball bearings. The stator and rotor have each a number of openings, generally rectangular. Vanes for canalizing the air start from the center of the rotor and end at the rotor openings. When the rotor revolves, centrifugal force drives the air through the openings, and the flow is alternately permitted or interrupted according as the openings in rotor and stator coincide or not. The rotor is driven by an electric motor of 12-15 horse-power. Conical horns of suitable shape and length are connected to each opening of the stator in order to amplify the sound. The Paris sirens have a total weight of about 1,700 pounds, and in the city cannot be heard beyond a radius of a mile, although in the open the range may be as high as five miles. Hand-operated sirens have also been built for giving the alarm in small towns.

Current Efficiency of the Edison Cell.—Messrs. M. de K. Thompson and L. R. Byrne recently conducted a series of experiments with the object of investigating the current efficiency of the separate plates in charging an Edison cell. Their method, which is described in the Transactions of the American Electrochemical Society, was that of comparing the quantities of hydrogen and oxygen evolved with the amounts of the same gases evolved in a water voltameter. A single cell of the B-4 type was used, having a rated capacity of 80 amp.-hours. The plates consisted of four positives and five negatives and the normal rate of discharge was 16 amperes. The cell had been standing idle for three years before the work was begun. In test No. 1 it was found necessary to pass 446 amp.-hours before the cell was completely charged. The current efficiency of the cell in this case was found to be 48.5 per cent and in the case of the next test 66.7 per cent. The conclusions reached are that the Edison cell after standing a long time requires a prolonged charge to bring it back into good condition. At room temperature the efficiency of charging the iron plate is generally greater than that for the nickel plate. At low temperature the efficiency of charging is reduced. On starting the charge a maximum in the efficiency of both plates is reached in the early part of the charge.

X-Ray Tube Manufacture in Wartime.—When the German government declared war and automatically stopped the export of a great number of "Made in Germany" products a chapter was begun in the manufacturing records of the Allied nations that reads like a novel. One of the articles, the principal manufacture of which was a trade secret of German manufacturers, was the X-ray Tube. In a recent issue of *Electrical Review* the difficulties encountered in the manufacture and repairing of these tubes both in the days before and during the war by an Australian manufacturer are told. The exhaustion of X-ray tubes requires not only the removal of air, but also the removal of the last traces of the gases that adhere to the walls of the tubes and the metallic electrodes. After years of experimenting before the war, this manufacturer finally attained a certain degree of success in July, 1914, by using a special type of Spregnal mercury pump. The outbreak of the war created such a demand for repairing these tubes that this equipment was not long satisfactory. By the latter part of 1917, however, this manufacturer was in a position to handle the rebuilding of these tubes on a commercial basis, although his organization has not as yet undertaken the manufacture of tubes. The war has brought several English and American factories into the manufacture of these tubes with such success that it has become another branch of export business forever lost to Germany.

Japanese whalers cutting up a big finback for meat and other uses



Draining the liquid spermaceti from the head of a sperm whale

The three-thousand-pound edible tongue of the gray whale of the Pacific

Whale Meat Approved by the American Public

The Probabilities of Its Ultimate Acceptance and the Advantages Thereof

WITH the encouragement and backing of the Food Administration, the whale supply corporations operating on the North Pacific Ocean began placing the meat of the great mammal on their nearest cities last spring. At first, Seattle and then Portland took the output, tried it and liked it so well that the supply had to be increased to make for further extension of markets. San Francisco followed suit and then all of the Pacific coast States. As the supply from the whalers increased, the meat reached as far east as Chicago and suburbs in July. It was not until October 1st that the whalers were able to put a supply on the New York market and the markets of the Eastern seaboard. It may now be stated that whale meat is being consumed, either in carcass like beef or canned, by the entire northern and western States. There is no difference in quality or taste in the carcass and canned product. The carcass form merely makes for larger steaks and roasts. Large quantities of the meat has also been shipped to the Allies, to whom, however, it is not new. Japan entirely and European countries in part, have consumed more or less whale meat for years. In consequence, it is believed that whale meat has done its part in war service and enabled the country to keep to nearly normal its usual supply of domestic animals. It has saved the breeding of cattle, hogs and sheep not only from threatened extinction but from even abnormal depletion. It has enabled farmers not only to hold enough stock to maintain normal breeding but also to grow their own supply and a surplus of fodder to sell. It has released ample meats of other types for the maintenance of soldiers and sailors on the war fronts and in training camps.

The plants for its preparation, storage houses for its keeping, and vessels for its distribution, are scattered along the North Pacific coast. The National Food Administration desires that Americans shall take the product in canned form as much as possible, as an aid in quicker and less expensive distribution. A price for the canned product was accordingly made more attractive than for the flesh in bulk. There are eight whaling stations in active operation on our coasts, belonging mostly to American and Canadian concerns. The Norwegians own a plant at Akitan, Aleutian Islands. There are two stations on Vancouver Island, two on Queen Charlotte Island, one at Bay City, Washington, one at Port Armstrong and another on the Alaskan coast. Two of these have ample cold storage plants and the others have been developing them as the meat industry enlarged. The same two have big canning equipments, which the others are in process of duplicating. The nearest supply station at Bay City, Washington, has put 300 tons of whale meat on the American and foreign markets this season, including the canned output. These seven stations have reported, to date, the capture of 659 whales in 1917 and are expected at the close of this season to have reached the 1,000-whale mark. Whale meat in its preparation is treated same as fresh fish, that is, after butchering, is placed in ice in vessel holds, taken to railway ports and forwarded over the country in refrigerator cars.

Probably the highest price paid for a beef steer on hoof was at a show at the Portland, Ore., stockyards. A prize steer weighing 1,300 pounds was auctioned for $1.20 per pound, or $1,560. As a rule, steers auction at from 15 cents per pound upwards to the limit. Dr. Andrews noted the prices whales produced for all their commercial parts in Japan, as follows: A 60-foot finback whale, $3,000; a 45-foot Sei whale, $750; a 40-foot humpback, best of all whales, $3,000. While sulfur-bottom whales would not be liked for eating here, in Japan, one 85 feet long brought $4,000 and one 75 feet long sold for $2,500. The Japanese prefer whale meat both stewed and raw. They stew it with vegetables. Raw, the meat is chopped like a hamburger steak and covered with their national brown sauce, or Shoyu. The price of whale meat in Japan varies according to season, up to fifteen cents per pound. The price, of course, is highest in winter. Whale oil was formerly only used in soap making. Now, it is also tried out by the usual process and converted into fats. We are coming to whale butter and lard. The first consignment of whale meat to reach New York from Bay City, was 300 pounds sent to Dr. Andrews at the American Museum of Natural History, New York. For a time, the Institution will receive and distribute the food, until it gets fully into commercial circulation. It is daily served cooked in the Museum's restaurant in the basement, where often distinguished men of science from everywhere form a galaxy of genius.

The meat of the whale extends in great masses from the base of the skull to the tail fin and downward to the middle line, or completely over the rib section. This meat, all of it of the same quality, amounts to ten tons for each 50 feet of length and each 50 tons gross weight of the whale. Above these dimensions, there may be 15 tons of solid whale flesh of best eating quality. In other words, one-fifth of a whale is meat, without computing the other parts, such as the heart, etc., that are edible. The steer, being also a mammal, with nearly identical skeletonic structure, represents almost precisely the same proportions. That is to say, a steer weighing 1,000 pounds, has 200 pounds of beef, but only a proportion of its meat of the first class such as characterises nearly the whole whale flesh. A 50-foot, 50-ton whale then represents in bulk, a herd of 100 steers of one-half ton weight each. He represents as much meat also as the herd. He is also equal to 500 sheep of 200 pounds each or to 300 hogs of 350 pounds each.

Of course, steers range up to a ton of weight, with a corresponding increase of weight of flesh. But, a whale also weighs up to 75 tons, representing a herd of 150 steers of a half-ton weight each. Any way you look at it, the whale has advantages over beef cattle. He requires no herdsmen or cowboys to care for him. He and his wife rear, feed and guard their own young without any assistance from laborers. There is no cost to any one to feed him or his family; no food, clothes or fuel to buy, with corresponding labor to produce them. When wanted, the whale is in his given haunts, ready to be taken. No butchering is required for him, the harpoon gun lands the fatal stroke. All you have to do is to haul him out and cut him up. The cost of whatever processes are required to put a whale on the market is so small in comparison with that of breeding and rearing a steer, that Americans, like the Japanese, will soon have meat as good as the best parts of beef at probably not over fifteen cents per pound and in as large quantities as any family needs.

One of the best parts of the whale for eating is his heart. The heart of a large whale weighs about one and a half tons, equal to say, 300 to 600 hearts of a steer, according to size. The Japanese nation, which now lives practically on whale meat, so far as meat is concerned, also eats the blubber and other edible parts of the whale, which Americans will probably never see, to say nothing of eating. A whale's tongue weighs upwards of 3,000 pounds. Although tougher than beef tongue, it is edible.

There are three species of edible whales, humpback, the finback, and the Sei whale. There would be four species but the right whale is now exceedingly rare and hard to capture, having for centuries been sacrificed for his whalebone. The humpback whale grows up to 54 feet in length and 40 tons of weight. The finback whale ranges up to 73 feet and 50 tons weight. The Sei whale may be 53 feet long and 30 tons weight.

A whale is a mammal, not a fish. It produces its young alive and suckles them same as a cow. Its flesh looks like that of beef, although admittedly a little coarser in texture, and it has a slight flavor of venison. Whale steaks and roast whale have been served in several of the leading New York restaurants for some time past, having had a preliminary test at Delmonico's restaurant. New York chefs have developed the best methods of cooking and serving, and have found that it yields to as many forms of preparation as beef. There is little to distinguish it from beef, when served on the table, either in appearance, aroma or taste. Many would be deceived into thinking it beef, if not told what had been served. It is only in America that whale meat is a novelty. In Asia and elsewhere, whale meat is the staple food.

Whale meat has every advantage over beef—mutton—pork. In the first place, the whale is a diseaseless mammal, and its salt water habitats contribute to its freshness, cleanliness, digestibility and healthfulness as food. On the contrary, cattle are subject to tuberculosis, foot and mouth and other diseases, more or less communicable to humans. As an example, according to the statistics issued by the University of California, a billion pounds of pork are annually lost to America from hog cholera. Sheep are subject to foot and mouth and other diseases. Disease also is destructive to immense numbers of the poultry and domestic food bird families. In brief, we have diseased meats of all descriptions, if bred on land, and no diseases to worry about if bred in salt water.

The meat of the back of the whale further differs from that of all other edible mammals, in that it is uniform, that is, all roasts and steaks, and also boneless. Its sirloin section, of some ten tons, is entirely lacking in those tough, cheap and nearly inedible parts characteristic of beef, which some of us have to consume or

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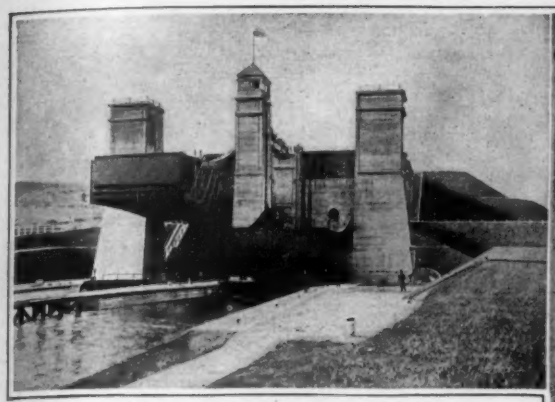
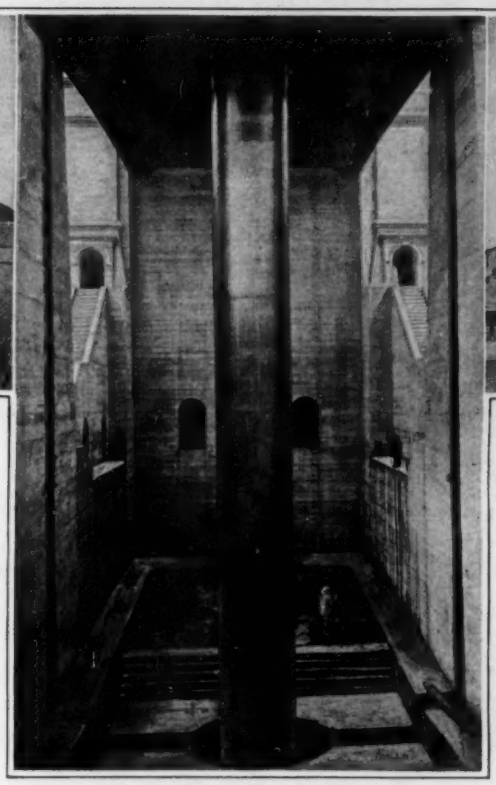
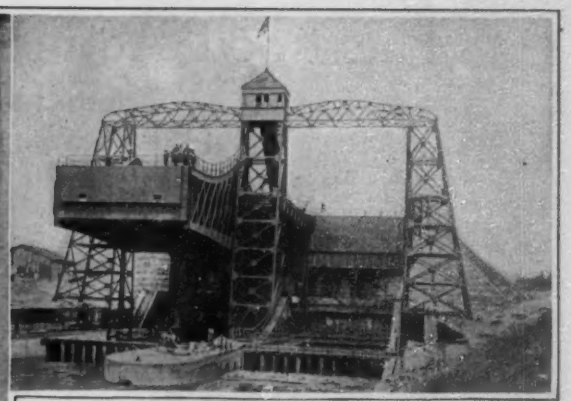
The edible flesh of one whale equals in bulk that of 100 steers or 500 sheep



The Peterborough lift lock



The main ram at Peterborough



The steel-frame lock at Kirkfield

Large Canadian Lift Locks

THE concrete substructure of the Peterborough hydraulic lift-lock, as well as of that located at Kirkfield, Canada, on the Trent Canal system, is of special interest. In the case of the Peterborough lock, containing 26,000 cubic yards of concrete, it is maintained that to have executed the work in stone masonry would have rendered the cost prohibitive, while it is doubtful that satisfactory results would have been obtained with the latter over the concrete construction.

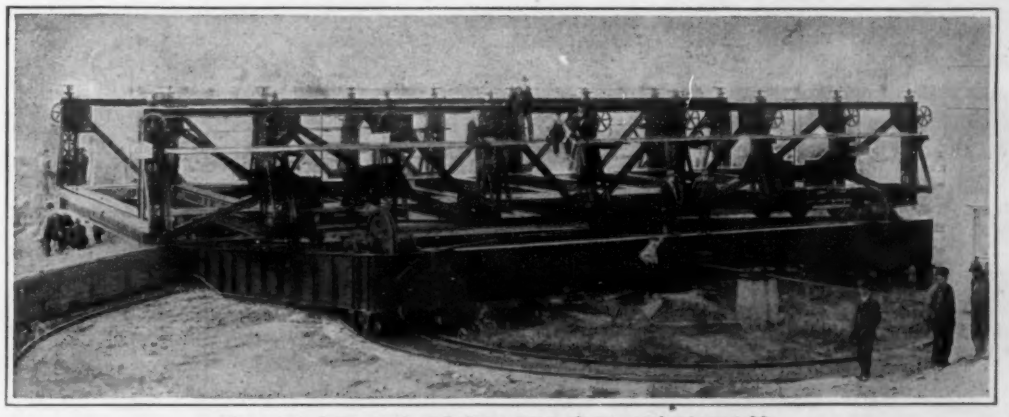
The concrete substructure was built on the solid rock found at the level of the pit floor. About fifteen feet above the bottom of the pit is the machinery room, 110 feet long, 17 feet wide and 12 feet high. The breast wall which retains the upper canal embankment is 40 feet wide, 80 feet high and 126 feet long across the lock. This wall is pierced by a roadway 21 feet high and 14 feet wide at the level of the original ground surface, while the top is formed into two waterways with wing walls extending toward the embankment to make up for the slopes. There are voids formed in it for shafts, passages, stairways and flumes, while for effect cornices, pilasters and string-courses have been introduced. There are three towers on the same transverse center-line as the wells, the total height of each being 100 feet from the rock-bottom up. The base of each of the side towers measures 29½ feet by 40 feet 8 inches, decreasing to 24½ x 30½ feet at the top of the side wall.

The shaft is vertical above this, measuring 18½ by 28 feet, while for operating purposes from bottom to top the inside faces of all are plumb. The sides of the center tower conform to the corresponding sides of the side towers, while for its whole height this tower is 12 feet wide. To provide for the variation in temperature and the widely different foundation pressures, the concrete substructure is divided into sections.

The Kirkfield lock was built with surroundings very different from the Peterborough structure, lying in a district of rock where the lines of a steel structure were more in keeping, and it is held that here the stresses in the towers could be cared for with a greater degree of certainty than in concrete. While making allowance for the difference in width, the Kirkfield lock was much the cheaper to build; there should, on the other hand, be no expenditure for upkeep of the concrete at the Peterborough lock. At Kirkfield the use of a large amount of steel in the construction of the chambers themselves makes the maintenance of the additional steel in the towers a simple matter, accompanied by no extra expense worth mentioning.

The concrete construction of the Kirkfield press wells and foundations is of special interest. The wells were excavated about sixty feet below the floor of the pit, in the transverse central line of the pit, and located 54 feet apart, 16½ feet being the diameter of the rock excavation. The nature of the rock made this work very easy. There is a foundation of granite for each well, as the whole weight of the lock chamber and its load is concentrated on the bottom of the press and distributed over the rock from that point. These foundation granite locks were 2½ feet or more in thickness, well bonded together in three courses, each granite lock being carefully dressed to a perfect true, while no joint more than $\frac{1}{16}$ inch is to be found in either direction, and every stone was set on a floating bed and beaten to its proper elevation. The mortar used for this work consisted of one part sharp sand and three parts cement.

The walls were lined with concrete, and as there was some difficulty experienced from water, in order to make the concrete linings as tight as possible the water was allowed to rise up to the finished work in the well, thus balancing the back pressure and saving the new concrete from the action of water that might have seeped through the rock before setting. The linings were found to be watertight while the presses were being placed, showing that this scheme was satisfactory. The approach walls of the upper reach were of concrete, terminated by a small breast wall about 20 feet back from the up-stream end of the pit. This was built on the natural rock and formed a public roadway across the canal.



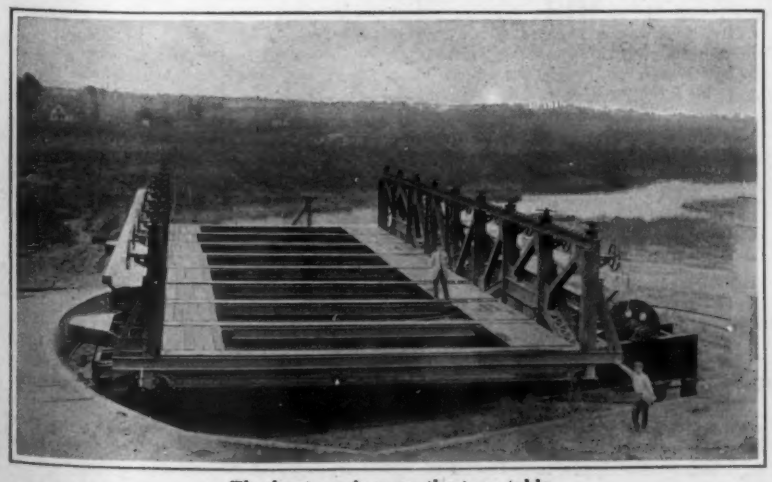
The empty boat carriage being swung about on the turn-table

A Marine Railway Instead of a Lock

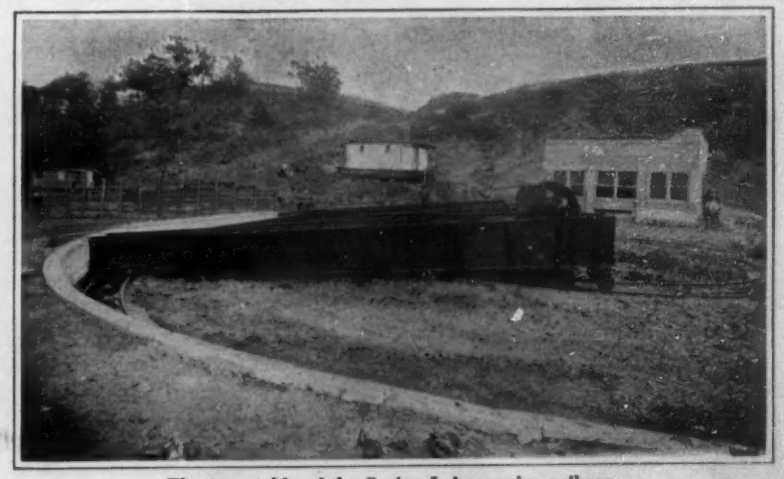
IN connection with a project for reclaiming some 14,000 acres of land in central Illinois which had always been subject to overflow by the river whose name the state bears, it was necessary to sever the natural connection between that river and a body of water known as Spring Lake. But local navigation between these two was considerable, so that after the difference in level had been permanently adjusted by the final installation of all the dams and bulkheads, a means of passing boats from river to lake and back had to be provided. At one point the two were separated only by a broad levee; so perhaps the natural assumption would be that navigation would be restored by means of a lock cut in this. But the cost of construction and maintenance of such a lock would have been so burdensome upon the Drainage District that the matter was referred to the State Rivers and Lakes Commission; and with the aid of a Peoria engineer, a way out was found in the idea of a marine railway.

In its broad outlines, the installation as finally effected consists of a track running from the water on each side to the crown of the levee, and a boat carriage to run on these tracks. But the gradient is ten per cent; and it would obviously be very bad practice to tilt a boat to this extent—especially with a cargo aboard, and with a heavy wooden cradle in partial contact with the hull. So the bed of the carriage is built at an angle of 5° 43′ (the angle whose tangent is 1/10) with the line of wheel centers; then when the wheels stand on the rails the cradle on which the boat is supported lies horizontally. As a final consideration, this makes the boat carriage an inflexible affair, which must always stand on the track with its low end above its high end. So after it has gone up with the low end in front, it needs to be reversed in order to go down the other side with the high end in front. This of course necessitates a turn-table at the top of the levee; and advantage was taken of this necessity to build the two lines of track leading up on the two sides in the most convenient location, which put them at a considerable angle to each other.

Each incline is a straight-away, consisting of four rows of rails—two standard-gage railroad tracks, spaced 50 feet apart, center to center. The tracks extend from the turn-table down into the water on each side of the levee to a depth sufficient to have four feet of water over the floor beams of the carriage at the low-water stage. The carriage is really a huge cradle mounted on wheels, at the angle already mentioned. It rolls down the incline into the water to receive the boats, is raised on the tracks to the turn-table and rotated thereon, and lowered to the water again on the opposite side of the levee, keeping the boat on an even keel throughout the operation. Electric current is brought 20 miles from the Canton public service.



The boat carriage on the turn-table



The turn-table of the Spring Lake marine railway

The Food Administration and the Nation's Response

Efforts to Stabilize Food Supplies and Food Prices

By Leonard Hatch, U. S. Food Administration

IF anyone, early in 1917 when this country entered the war, had ventured the prophecy that in the space of a few months, the American people could change their habits of what to eat, or what not to eat, or when not to eat it, many wiseacres would have smiled sceptically.

If it had been further intimated that the American people would succeed in changing their methods of food distribution—from producer to consumer—instantly grasping the fact that such changes were necessary for the greatest military effectiveness overseas and economic stability here at home, that scepticism would have deepened.

Finally, if it had been suggested that the American people could be thus stimulated merely by a conflict 3,000 miles away, the sceptical smile might have become open incredulity.

And yet, since the Food Administration came into existence, all these things have been accomplished by the American nation, which has realized that the success of Allied military operations abroad depended upon the proper solution of food problems here at home.

The United States Food Administration came into actual existence on August 10th, 1917, when Congress passed the Food Control Act, and Herbert Hoover was appointed Food Administrator by the President.

The aim of the Food Administration was, and is, in a sense two-fold:

(a) To provide the Allies (soldiers and civilians) and our own soldiers at the front with food supplies ample enough to render maximum assistance in winning the war.

(b) And at the same time to keep food supplies and food prices here at home as stable and reasonable as war time conditions permit. To accomplish this, the Food Administration uses, wherever necessary, powers of compulsion conferred upon it, but relies chiefly (and not in vain) upon the coöperation of food dealers and public alike.

Such are the aims of the Food Administration summarized as briefly as possible.

Now in war time, there has always been a tendency for food prices to rise. To check, in so far as possible, such invariable tendencies, the Food Administration has directed special efforts against speculation, hoarding, and unreasonable profits, at the same time making efforts to see that both food producers and food dealers received fair profits. The commercial routes by which food moves from producer to consumer have been rendered as unobstructed, as direct, and as little conducive to price increases, as is possible.

A licensing system was adopted as one means to such ends. By this system all the agencies having a part in the distribution of certain specified staple foods between producer and retailer (*i. e.*, roughly speaking, the wholesale trade) as well as retailers doing a business of more than $100,000 a year, are put under license and are held responsible to the Food Administration.

Under this system any practices detrimental to the conduct of the war or unstabilizing to food conditions at home, may be held in check. Moreover, by the aid of statistical reports required under this licensing, it has become possible to take stock of the food supplies in the country, and distribute these according to needs.

As a result, not only have the supplies required for overseas shipment been forthcoming, but the entire population of this country has been sustained in normal strength and health.

Two of the most efficacious methods by which the Food Administration achieved equalization of distribution and price stability, are through the United States Food Administration Grain Corporation and through the division of Coördination of Purchase.

As a means of avoiding the chaotic conditions and high prices which would otherwise result, the Grain Corporation has practically entire control of the buying and selling of wheat. This includes wheat sales to the Army and Navy, and to Allied and neutral destinations. As a result of putting wheat on a basis of business management, the farmer gets more for his wheat, while the consumer pays less for flour.

In May, 1917, there was a difference of $5.86 per 196-pound barrel between the price of the farmer's wheat and the flour made from it. This difference had dropped to 64 cents, 15 months later. In May, 1917, with no food control, flour sold at wholesale for $17.00; but by February, 1918, the wholesale price had dropped to $10.50. Without food control, flour might easily have risen to $50.00 a barrel. After the Civil War, *even when there was no such world shortage as exists today*, the price of many foodstuffs rose in a similar ratio, showing what may happen without food control.

The Food Administration's institution of a division for Coördination of Purchase has handled the buying of food supplies for the Army, Navy and Allies. Such a system has prevented the large foreign buyers from bidding against each other, and has obviated an upheaval of economic conditions here, as a consequence of the enormous purchases of foodstuffs for our fighting forces and for the Allies.

Perhaps stabilization of food prices here at home has been due most of all to the coöperation with the Food Administration of the food trades. Their representatives have come from all over the country to confer with the Food Administration. Their willing acceptance of maximum margins of profit has been one of the finest examples of the heights American patriotism has reached during this war.

More familiar, because more widespread, is the way the public has coöperated in solving the food problems and shouldering the food burdens which have determined, literally, the winning or losing of the war.

It has always been Mr. Hoover's belief that the American people understanding the situation, would freely share their food with the stricken and hard-pressed Allies. He believed that the spirit of American democracy and American idealism would forestall the need of a rationing system, cumbersome and costly as it would necessarily be. And his belief has been justified.

The case of wheat epitomizes the whole drama of saving and substitution which has been enacted by the men, women, and children of this country. The Allies needed wheat sorely. In January of this year they told the United States Food Administration quite frankly just how dire this wheat need was.

The Food Administration passed this message on to the country. And the country gave—and gave—not from supplies destined for export but from their own pantries and tables. Our 1917 wheat crop was not a large one, but from it 85,000,000 bushels were shipped to Allied destinations *after our regular exportable surplus was exhausted.*

And this is merely an example of the way the people of America—particularly its housewives—saved, and substituted other foods for those which had to be shipped to the Allies.

The record is one to silence forever the sceptic who wondered whether the American people were capable of the adaptability and sacrifice necessary to make our food a real weapon toward winning the war.

But the end is not yet. This is no hour for relaxation from past achievement. Merely because of the great and welcome change in the military situation since we entered the war, we are not released as a nation from further food responsibilities. It is true that the United States needs food enough to maintain its strength, but that is the limit for our home consumption. Beyond that, our food must be shipped overseas to those who must have it. We must sit with them at a common table.

For the year ending July 1st, 1918, we shipped to Allied civilians and armies, our own armies, the Belgian Relief, and certain neutrals dependent upon us, 11,820,000 tons of foodstuffs. For the year ending July 1st, 1919, these same destinations will require 17,550,000 tons—half as much again.

Nor will the situation be modified by the coming of peace, for the end of war will demand accumulative stores of food to feed the multitude who have been the victims of Germany.

America's opportunity to allay hunger and help save civilization with food has just begun.

Sugar Shortage in Argentina of Seventy Thousand Tons

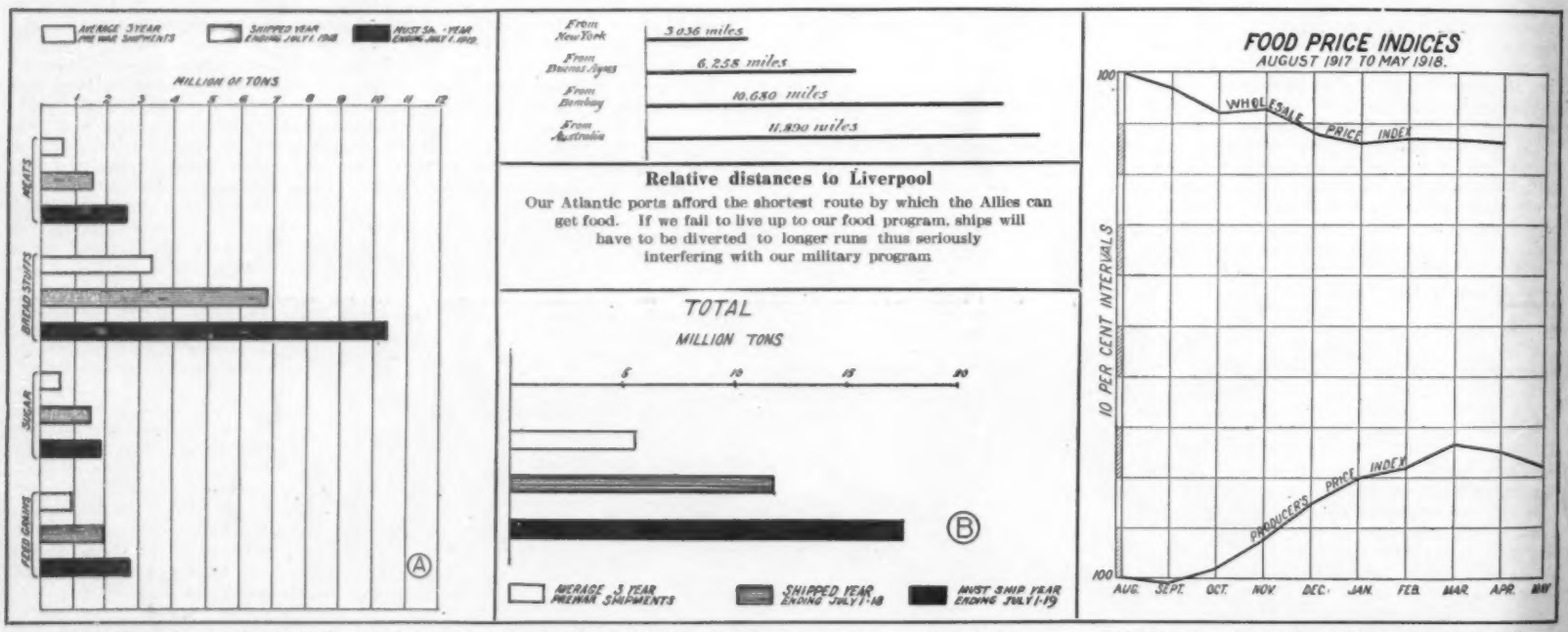
IT appears that the warring nations are not the only sufferers from inability to secure customary supplies of sugar. Even countries producing their own cane are not immune from this affliction. Heavy frosts in her sugar producing regions, followed by excessively warm and wet weather, have brought Argentina face to face with a shortage in her coming harvest of from 60,000 to 70,000 tons. Much cane is rotting in the hot, wet fields faster than it can be cut.

A local review expresses the hope that "the Government will act without delay to assure that the arrival of foreign sugar shall quickly operate with salutary effects upon the speculators who have cornered the national product and have thus caused it to rise to ever higher prices." We fear that if our South American friends are anticipating any action on the part of their Government that will enable them to have normal supplies of sugar, at any price, they are doomed to disappointment.

The prevailing retail prices of 16 cents per pound, and upward, for refined white sugar, it would seem from this distance, can only be the result of unwillingness on the part of the Argentine public to accept sugar curtailment. Instead of looking to foreign sources for a restoration of sugar plenty, that public would do better to strive for a realization of the fact that these are times of war.

Grain Elevators for South Africa

A SYSTEM of grain elevators now under consideration by the government of the Union of South Africa comprises equipment of 1,000 to 10,000 tons capacity at interior stations and of 20,000 to 50,000 tons at the shipping ports. American manufacturers interested in supplying the machinery and installations are advised by the American consul general at Cape Town to send their catalogues to the commercial information bureau attached to the consulate.



Food shipped to and required up to July 1st, 1919, by Allied civilians and armies, our own armies, the Belgian Relief, and certain neutrals dependent upon us. Diagram B gives the totals of Diagram A

This diagram shows that while prices paid to the producer averaged higher, prices charged by the wholesale trade averaged lower

War and Discovery

Some Observations Upon the Effect Which the One Has on the Other

By Thaleon Blake

FOR an unprepared people, we have been strangely proud. Having strength of numbers, we confided in mere numbers. But lately we have been learning that there is a greater strength in skilled organization. To become invincible, we must add to numbers, training; to training, courage; to courage, audacity; to audacity, genius. Learning this, we make a great discovery not cataloged in war inventions; practicing this, we make democracy to master and slay autocracy.

A great many of us are looking to the war inventors for miracles. Some are losing patience with American men of science because they have not as yet found a way to win the war by a lightning stroke. And the much-heralded inventions pictured in the press have bred skepticism abroad and false hopes at home.

This is the rub with invention: Some lucky wight may win fame and fortune with a war invention, or 10,000 may fail. Still, it has become patriotic to invent, or be in a state of mind of about to invent. Everything receives attention, from glorified flivvers of the air to submarine annihilators, from manless dirigibles to womenless nursing. War is indeed terrible.

Yet while invention is rife in every hamlet, only guarded allusions to it are heard because inventing is something nobody does in public. Not that there is anything to be ashamed of, but somebody might steal the inventions.

Foreigners as well as Americans have shared this belief in the potency of our inventors. The imaginative writers among our Allies gladly welcomed America's entrance into the war with food, munitions, men; but most of all for the magical gifts of our inventors, who should, by some supreme discovery, enable the Allies to obliterate the enemy. This implicit faith is the most touching tribute to the wizardry of American inventors of talent.

Less is heard of this appealing note nowadays. The myth of our super-humans is waning. Naturally so, in this instance; for great discoveries are not made offhand, and to order. That the fable is dying is salutary.

Meanwhile our scientists and master mechanics may coördinate their skill and their knowledge for the common weal. They begin without experience, for military inventing has never been seriously recognized as a career by American inventors, because we were not a military nation, specializing in war tools, and perhaps because of a widely-held belief that new ideas affront bureaucrats. It is known to schoolboys that several of our notable war inventors received their first appreciation on the Continent. While hostility to inventors is temporarily a thing of the past, inventors cannot be taught in a day the state of military invention, its history, needs, and trend; they cannot work at strange employment in a spectacular manner.

It is encouraging to hear that our government is now determined, as regards military inventions, to lose nothing good, and to assure nothing bad. Ideas are wanted. Beginners are wanted to experiment. Somehow, somewhere, some untrained, obscure person, may bring forth the Great Idea. If it were only possible! Scholars doubt it.

Historians offer the annals of science in demurrer. Freshness, they say, may be supplied in person, but not in amateur inventing. Fresh outlookings, untrammelled by scholastic tradition, might encompass triumph elsewhere. War itself is a borrower, not an originator; an adopter and adapter. Witness the stone axe, the first great invention, and the next, the bow and arrow, both created for the chase.

Psychologists also are incredulous. Critics of this persuasion affirm that scientific imagination is an attribute exceedingly rare and precious; that, while artists and authors require long years of apprenticeship to master style, which is their instrument, so scientists, in their metier, cannot be developed sooner. Morever, they say, creation demands poise, contentment, freedom from worry—call it peace.

All this may be true, with exceptions. It is for exceptions, then, the government must be looking so ardently. Some of the most fertile-minded mechanics and engineers have never read an explanatory line of what might be done by them in military invention. It is as if the country said to them, "Gentlemen, get busy. Only do something. Do your worst, if nothing else."

And some of them are doing that, too. Nevertheless, no government can compile a list of "one hundred inventions" needed to end the war, for the obvious reason that whoever had imagination sufficient to do that could go a little farther and make his dreams come true. It is no mean invention to find something to invent.

Now is the time to recommend that the enormous amount of thought that is being given to war invention be first of all practical. It is imperative to remember that great inventing is a side line to practical daily toil. The chemist and mechanical engineer declare that the demand for small improvements to existing inventions is overwhelming. Here capable men may concentrate. The desire to help America may be shown by tickling the bosom of Mother Earth with a hoe as well as by formulating a scheme to wipe out a couple of Rhenish provinces in six minutes or less. Fine ideas usually come unexpectedly. There's the farm machinery needing repairs, or improvements could be made at the mills. Since war is inimical to great discovery and favorable to the use and abuse of old discoveries, America needs thinkers for practical endeavors of all sorts.

Many writers, knowing the psychology of our public, some of these scientists, some even inventors, are idling on the side lines. Besides better everything for the war, the old machinery should be made to last another year or two so that new steel can work elsewhere for Uncle Sam. Americans may keep the wheels of thought turning in their heads if they wish to, but we can't afford to keep a single wheel idle elsewhere. "Practicality" is the slogan. The little things are easier to do, and in the aggregate amount to a victory.

It is surprising how invention can enter into many unsuspected employments. Thrift, heretofore an idle word, calls for creativeness. The use of substitutes is both a novelty and a challenge to ingenuity. Leading statesmen are fearful that America is not awake. Arouse the women and America will soon be awake. The American woman is an alarm clock and a dynamo. This is a job for our masterly writers. War lords sneer at writers, censors delete them, graft and incompetence hate them. Not dull verbalists, but master artists, are capable of winning the women's coöperation, which will depend upon whether the women are intelligently taken into partnership with Uncle Sam as a going concern.

As to mechanical invention, the miraculous is the obvious newly applied. That we shall win the war goes without saying, but the winning must be done in the old-fashioned way, with highly-trained, healthy troops; with arms, ammunition, food, ships—the same

(Continued on page 402)

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

The Wireless Plane

To the Editor of the SCIENTIFIC AMERICAN:

It appears from Mr. Wiley's criticism, in your issue of August 24th, of Mr. Lowater's suggestion that appeared under date of June 1st, that we still have with us those who, disregarding the actual accomplishments going on every day, will persist in their adhesion to the time worn notion "it can't be done."

If Mr. Wiley understands first the underlying principles of the emanation of electro-magnetic waves, and the production by these waves of alternating currents when cutting a set of conductors whose capacity and inductance are properly adjusted to such waves, and second, that high frequency induction motors are entirely feasible and that they already exist in the experimental stage; then why does he condemn the idea of an airplane or a motor truck or a submarine or anything else being actually run by "radio" energy. To be sure, we must first learn of some method for directing such energy, else there would be the same waste now existing in the transmission of wireless messages—a waste which would be prohibitive when multiplied by the power requirements of an airplane; but while this may require quite a stretch of the imagination, it hardly seems in order to characterize it offhand as impossible. When we all realize that the world's supply of crude oil and petroleum will some day be exhausted, and are aware that to date human ingenuity has always been able to meet such an emergency, it would seem that encouragement rather than discouragement were in order, and that it is distinctly given to hope that Mr. Wiley may not have to live to an exorbitantly "ripe old age" in order to see radio *propelled and controlled* planes flying over his housetop.

H. PAUL MILLER.

San Francisco, Cal.

"Give Them a Start!"

To the Editor of the SCIENTIFIC AMERICAN:

There has been some talk in various quarters about cancelling the debts of our European allies to this country, debts incurred in the waging of the present war. It would be a graceful thing to do, but, while I think the offer would be much appreciated, it would be declined. Unless the circumstances are overwhelmingly difficult, and there seems no way to get around them, a nation seldom likes to have its just obligations remitted.

But I think there may be exceptions to this generality so patent that those who desired to help a nation could hardly endure a refusal to accept the help. The industrial world has before it the spectacle of one of its most important units completely erased, and this same industrial world cannot tolerate the thought that Belgium must begin to build in her ashes, with the knowledge confronting her that she has an enormous debt to pay later to America, who stands uncovered before her bravery and sacrifice.

There is no place so good as the columns of the SCIENTIFIC AMERICAN to place before the engineers of America, who owe Belgium so much, a proposal, or slogan, call it what you will. Let us say to our country first, and to our industrial giants second, that the gallant little nation need no longer consider herself in debt to America. The slate is clean. Have we not enough influence, and will we not use it, to give the world a slogan for our relations to Belgium in the immediate future? Why not say to Uncle Sam, and to each other, "Here's to our gallant brothers. Give them a start."

It must not enter the thoughts of anyone that the heroism of Britain, and the suffering and unlimited endurance of splendid France is any the less thought of because it is proposed to erase the debts of little Belgium, and not those of the rest. Britain is sorely hurt, but her lands are intact. France is immeasurably worse hurt, but while her lands are invaded, her women and children murdered and carried away by the fiends who invaded her, she has still a lot to commence building on. But the heart of all mankind suffers at the spectacle of Belgium, and we, as engineers know what it means both to them and to us.

Therefore Mr. Editor and gentlemen, I propose to you the slogan:

GIVE THEM A START.

Chicago, Ill. ROBT. G. PILKINGTON.

A Word from an Ally

To the Editor of the SCIENTIFIC AMERICAN:

It is rare that a reader of the SCIENTIFIC AMERICAN, even of so long standing as myself, has a chance of pointing to an inaccuracy in your most interesting journal. So you must allow one to take advantage of such an unique apportunity when it occurs. Here it is: On page 215 of the September 14th, 1918, issue you print a paragraph and illustrations of a "Novel Gunstock Attachment for a German Automatic pistol of the Mauser type." This is not the novelty you state it to be. As a matter of fact I bought in London in 1899 an exact replica of the article which you reproduce and used it during the South African War. And a very useful and accurate weapon it is.

Whilst writing to you I cannot refrain from informing you how greatly your journal has been appreciated by myself and many of my brother-officers in France during this war. Particularly have we enjoyed its pages which deal with "Strategic Movements of the War," and the helpful confidence in the eventual success of ourselves and our Allies which your articles have never failed to display. They have cheered us up many a time in adverse and depressing circumstances and done their bit to keep our patience and our hopes alive and firm even before your Nation came in to help us in our hour of need. Part of our thankfulness for the tenacity and fortitude which have inspired us to hold on till these splendid Allied victories are crowning our common cause with success is due to your journal; and others like it, which have written words of encouragement and confidence to us throughout the whole war.

MAJOR C. L. WARD-JACKSON.

Headquarters, Western Command, England.

An Official Indorsement of Perpetual Motion

A Pennsylvania State Inspector of Boilers went home from a Fuel Administration symposium at Columbus, Ohio, via a Pullman car to Pittsburgh. Naturally, he was in just the right frame of mind to be scandalized by the fact that, although the journey was begun and finished in broad daylight, 20 lights were continually burning in his car. So, noting the placard requesting passengers to forward their complaints and suggestions, he did just that; he sat him down and wrote a nice letter to the Railroad Administration, pointing out that such prodigal use of lights was quite superfluous, and calling attention to the saving in fuel that would result from their suppression.

It is not clear just what sort of person is in charge of Mr. McAdoo's Office of Suggestions and Complaints; but it is very clear that he is not an engineer, or even a near engineer. In fact, it would appear that he must have been promoted from a position as filing clerk, or something of the sort. The Boiler Inspector, writing in a recent issue of *Power*, says that the following is a substantial abstract of the official reply to his suggestion:

"Your letter would indicate you are under the impression that generally the current for electrically lighted cars is generated through an agency requiring the use of coal. The current for most of these cars is generated by a dynamo connected with the car axle, and no agency requiring coal is used !!!!!" We may add that the exclamation points are our own.

The very comment which we would ourselves have made on this polite note has been taken out of our mouths by the recipient of that note. He wrote back to Mr. McAdoo's able assistant, suggesting that if the matter were as he had stated, a far greater saving of coal than contemplated in the original suggestion could be effected; that it would only be necessary to hitch a larger dynamo on to the axles, and use that dynamo to operate the train, thus doing away with the engine and the engine crew and the engine consumption of fuel all at one blow. We do not know what steps have been taken to apply this excellent suggestion.

In the Service of the Guns

Training Enlisted Specialists in the Care and Operation of Heavy Artillery

By C. H. Claudy

A taste of service conditions for future army tractor men at Fort Monroe

TO the man in the street a big gun is an engine of destruction which requires a charge of powder, a shell, a man to fire it and some one to go and mop up the German fragments. To the heavy artilleryman a big gun is something which must be cared for like a sick baby, which requires a regiment of men for its proper moving, placing, firing and care, and which needs the services of a large number of highly trained men to be efficient.

Besides the officers who have charge of guns and the men who man them, certain specialists are absolutely essential, and to train these, the Enlisted Specialists schools at Ft. Monroe have come into being and are now busily engaged in making Master Gunners, Sergeant Majors, Electrician Sergeants, Radio Sergeants (or radio electricians) and Motor Transport men.

The courses are 12 weeks in duration for all save the motor transport men, who receive but four weeks of instruction, their duties being much simpler and the requirements prior to induction much less than in the case of the other and more skilled branches of this non-commissioned work.

The pay is relatively high. As an enlisted man, any candidate in any of these schools receives $30 a month and his food, clothing and quarters. If he is married, he allots half his pay to his wife and the government allows an equal amount, with extra allowances for children. But in addition he gets from forty-eight to eighty-one dollars a month according to his grade and skill. The pay and allowances for a Master Electrician thus amount to more than the pay and the allowances of a second lieutenant, who must feed, quarter and clothe himself from his allowance.

Of the five schools maintained at Ft. Monroe probably that of the greatest importance is the Master Gunner School. Certainly it has the hardest time to get and keep candidates, for the all-sufficient reason that a man qualified to take this course and graduate is usually also qualified to take the officer's course and graduate. But it sometimes happens that a man will have all the requisites of an officer but one—he may have a poor voice, or stammer, or lack something in personality which permits him well to command men. If he is so afflicted and has yet the necessary education and mathematical training, Master Gunner may be an ideal position for him. Applicants for Master Gunnery courses should have a good mathematical training, including some trigonometry, and at least six months of mechanical drafting. A civil engineer usually makes a crack Master Gunner, and undergraduates in civil engineering courses qualify easily.

Master Gunners must know surveying

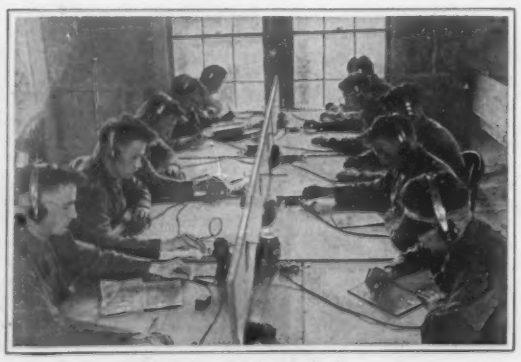
Four Master Gunners are assigned to every regiment of heavy artillery going overseas, where they assist the orientation officer in making field surveys, locating batteries and observing stations, finding ranges, making working drawings of broken ordnance parts, panoramic sketching, lay out spurs and sidings for railroads, batteries and similar duties. To qualify men for this work, the three month's course takes them through mathematics including trigonometry, surveying, including making topographic and working drawings, panoramic sketching, photography, precise triangulation, and some ballistics and gunnery. Rather a large order for three months, but with the system worked out at the Ft. Monroe schools, not too big to be practical.

An educator trained in the ethical methods of education followed for so many years by our schools and colleges would probably be horrified at the principles on which these schools work. They have no use for the "all work and no play makes Jack a dull boy" idea—it is only three months, and the man who cannot work at top speed for that period with no time for play save Sundays isn't wanted. They have no use at all for theory for the sake of theory. Any theory not necessary to understand the practice isn't necessary, is the school's theory. They do not believe in grading a class to the speed of the slowest witted. The class speed is fixed in advance. If you can keep up, fine. If you can't, they won't wait for you. But they won't drop you merely because you can't keep up—if you show aptitude and work hard, you may be turned back to take the course over again, but you will not find class or instructor waiting for you. They don't believe in working three months and then holding an examination to find out what you know. You are marked all the time on everything you do, and you, as well as the instructors know just how much you know, and just where you are weak all the time. These principles underly the scheme of highly intensive instruction which is followed in all the schools—and the best proof of their efficiency is the fact that they work out and that in three months men *are* trained—because the need is great—satisfactorily to do work which, in peace times, might have taken them years to learn.

Fifty men start the Master Gunner's course every third Monday and the demand is greater than the school can as yet supply.

Totally different, yet as highly important, is the Sergeant Major school. The Sergeant Major at home is the secretary to the commanding officer to whom he is assigned, and has charge of all the paper work of his organization. Overseas, eight Sergeant Majors are asigned to every heavy artillery regiment, six junior and two senior. At regimental and battalion headquarters they handle the paper work of their organization.

For this highly important work stenographers, typists, experienced clerks and secretaries are eligible provided they are physically and mentally of the type to make good soldiers. For the Sergeant Major should be the best soldier in the regiment. He outranks all non-commissioned officers. He is looked up to as, and should be an example of, all that is soldierly in dress, deportment, knowledge and conduct. A stoop-shouldered, near-sighted, long-haired anemic stenographer may have the finest of mental equipment and be the best of secretaries to the busiest of railroad presidents, but he will never make a Sergeant Major.



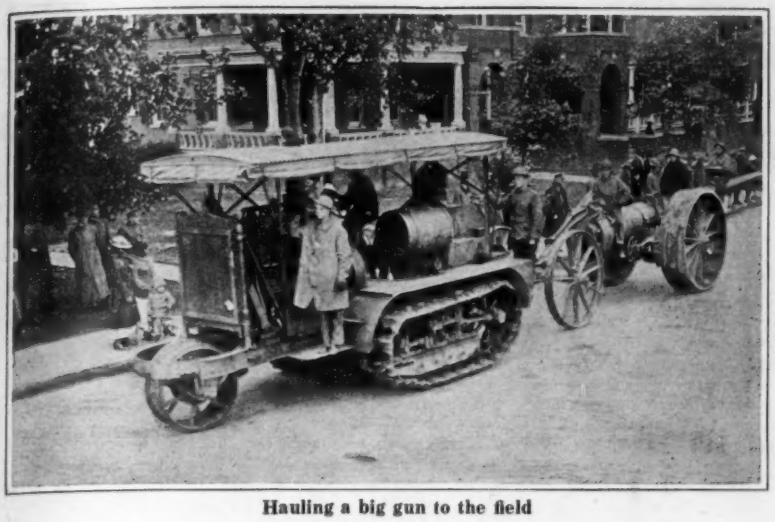
Twenty words a minute

The school is a business school specializing on military business. Its curriculum includes spelling, typewriting, army paper work, official communications, army regulations, manual of courts-martial, blank forms and army filing systems. Here, as elsewhere in these service schools, a successful effort is made to turn a civilian into a soldier, a clerk into a non-commissioned officer, an office worker into a secretary who can do his job in a dug-out or under fire—in three months. Eighty candidates start every third Monday and graduate as Sergeant Majors, junior grade, promotion to Senior grade being by selection as vacancies occur.

No big gun battery functions without an efficient system of electrical communication. Overseas the Electrician Sergeants install and maintain the electrical communication systems of the regiments to which they are assigned, and are thus sure of duty at the front. Every gun of every battery must have electrical communication with the battery commander, and so the electrician sergeant must know something of telephony as well as ordinary electrical circuits. Ninety students begin this course every third Monday and have practical instruction in motors and generators, laboratory practice with both D. C. and A. C. current and apparatus, the fire control apparatus (*i. e.* fire control means control of the fire of guns, not of conflagrations!) storage batteries and cable tests and repairs, internal combustion engines, searchlights, machine shop practice, steam engines and boilers and all sorts of wiring. The requirements are more a receptive mind than educational—a man must be able to assimilate technical details and grasp unfamiliar principles quickly or he will never make a good Electrician Sergeant. A certain amount of familiarity with electricity and electrical apparatus for a candidate for this course, and mathematics through elementrary alegbra, are essential.

This course is even more of practice and less of theory than some of the others. There is class-room work, of course, but much of the work is done in the extraordinarily compact and well equipped school laboratories. Naturally, with the United States government resources behind them, these schools do not lack for anything in the way of equipment, and the student is not handicapped

Radio Sergeants in the making



Hauling a big gun to the field

All training does not go smoothly

by the need for any apparatus which is required for study. Of course, to make a man into a competent steam engineer, electrical engineer, electrician, searchlight expert, machinist, gas motor engineer and cable engineer in three months, is rather a large order. But it should be remembered that the Electrician Sergeant, while he meets many and various problems in each of his many lines of work, meets with them only within certain well-defined limits. His steam engineering and boiler practice for instance, are concerned with small stationary engines, not with engines or locomotives. His searchlight work is confined to army searchlights, his wiring to lighting, telephoning and charging circuits, his motor and generator labors to operation and simple repairs, not at all to building or calculation. And so it is that by eliminating all useless theory, and including only practice in things actually demanded in the field, the course has been made possible and the success of its graduates—who go overseas as fast as they are graduated—speaks for its practicality.

The Electrician Sergeant is not required to handle radio work (luckily for him!). Radio Sergeants are trained especially for that work, in an entirely different course. They, too, must have elementary algebra to take the course, three years of high school or its equivalent is demanded, and familiarity with electrical apparatus either by school or practice is desired. But the knowledge which sharply differentiates the candidate for a Radio Sergeancy from the candidate for an Electrical Sergeancy is that of radio work, no candidates now being accepted in this school who have not a sending and receiving speed of at least ten words a minute in Continental code. Men who have this ten words will have 20 or over at the completion of the course and, as well, be competent radio electricians. The course includes buzzer operating, code keywork (it should be noted that he who can send and receive ten words a minute on "straight" matter is often lost when it comes to sending and receiving code, and one of the first things taught in operating is to think and receive *letters*, and not *words*). The course also includes electrical circuits and electrical units, storage batteries, detectors, radio laws, other forms of signaling and practical field work in operating.

It is impossible to say of any one specialist that his work is more vital and more important than that of others. But it can be said that the Radio Sergeants are by no means the least important. The success of modern long range gunnery depends very largely upon satisfactory observation of fire, and in many cases the only way in which fire may be observed is via airplane. The method of communication is of course wireless. So the Radio Sergeant and his apparatus form the liaison between the observing aircraft and the gun, and the proper functioning of the whole—weapon, observer, and gunner—depends upon the accuracy of the means of communication maintained.

One hundred and twenty men start the course every third Monday, but this number is not enough and plans are now being made to enlarge the capacity of the school.

The Motor Transport men trained in the Enlisted Specialists Schools at Ft. Monroe have a somewhat easier time of it than those who are to graduate in the more highly technical branches. The course requires but four weeks, during which time the students learn to drive trucks, tractors, passenger cars and motor cycles. A grammar school education and some experience with motor cars are about the only requirements (beyond those ever present requirements of near-perfect physical qualifications).

The first two weeks of instruction cover the theory and operation of gas engines, fuels, cooling systems, lubrication, electrical appliances used on cars, trouble hunting and field repairs. The final two weeks are spent in field work, which is, as nearly as possible, done under similar conditions to those which obtain in France. Thus, night driving is done without lights, and convoys are sent over the none too good roads about Ft. Monroe under signals, etc. A completely equipped repair shop at Ft. Monroe is constantly hard at work repairing the damage done to the equipment by too enthusiastic students. As 350 begin the course every week, and as all must learn to drive and to drive well, the mortality in trucks, tractors, and other motor vehicles would be heavy were it not for the skilled repairs constantly going on.

This is only one of the jobs that the Electrician Sergeant has to be trained to tackle at a moment's notice

Instruction in the Enlisted Specialists school is by officers who have specialized in the branches they teach, and who have demonstrated that they not only know how to know, but how to impart their knowledge. Classes in various subjects are constantly given to new graduates of the officer's training school, who are fresh in both knowledge and enthusiasm. In some of the classes ability to "dig" for knowledge is at a premium in a teacher, because what is wanted in a graduate is a man who knows, not merely one who can make a brilliant recitation. Thus, in the Motor Transport class, some young men who are entirely familiar with motors and motor theory may be sadly lacking in the ability to express what they know in words. Graduated, such men would be highly efficient drivers, yet might fail utterly in satisfying an instructor that they know what they do know, if he were not able to dig it out for them.

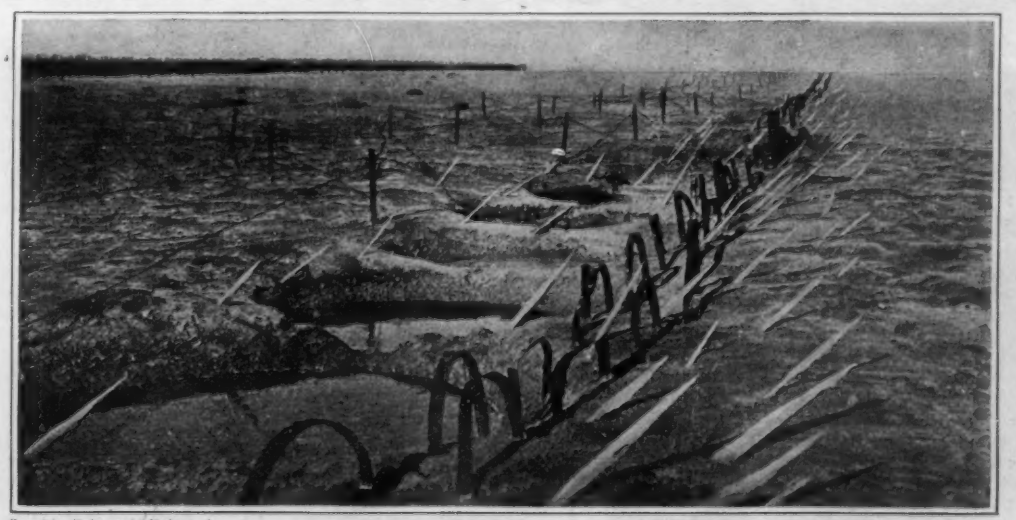
The morale of the schools is extraordinary. There is no visible feeling of being "at school." There is no apparent "teacher's discipline." The Enlisted Specialists students, being made into soldiers at the same time they are taught to be specialists, seem to catch the enthusiasm of the instructors, and to get the spirit of the place almost immediately. This is a big war. It is so big, that it can't be won without big guns. Big guns can't be operated without well-trained men, and well-trained men cannot function without highly trained specialists for the various lines of expert work required to transport, place, aim, shoot, protect, and care for the weapon. Men cannot be trained fast enough as it is—to fail in the training is to hurt the service. All this the students get as quickly as they get it unconsciously. But they get even more. Even a casual trip through the schools such as was made in two days by the writer, for the SCIENTIFIC AMERICAN, makes it very evident that the reason the schools have so high a morale, and the reason they are so successful in doing so big a job so quickly, is because of the utter belief in the possibility, and the spirit of the officers entrusted with the work. Every pair of shoulder straps associated with the school seems to be on top of a man who thinks his particular job is the most vital job, and that the entire fate of the nation and its war rests upon his work. If there are clocks in the school, both students and instructors regard them as enemies, not friends—they mark the termination of periods which ought to be longer! Students are pushed through, pulled through—one almost writes "yanked through" when necessary—a good man is not

(*Continued on page 403*)

Turkish Defenses Failed to Halt the British

THE Allied victory over the Turkish armies was not readily won. While the attention of the entire world was riveted upon the battles along the Western front, the British armies in Palestine and Mesopotamia were battling their way forward against the most resolute and skilled defensive actions of the Turkish forces. Heavy artillery, thousands of machine guns, fleets of tanks, and other characteristics of modern warfare were resorted to in these two theaters, aside from many odd methods of combat brought about by the nature of the terrain.

Typical of the defensive measures which the Turks resorted to in order to halt the British forces in these theaters of war, is the odd system of entanglements shown in the accompanying illustration. This formidable line of obstacles, consisting of sharpened stakes driven in the ground at a 45-degree angle, sharp steel hoops, deep pits with sharpened stakes at the bottom of each, and the usual barbed-wire entanglements, is quite primitive and certainly out of place with defenders equipped with machine guns and other modern means of defense. Formidable and barbarous as such defensive systems were, the British overcame them by heavy artillery preparation and fleets of tanks.



Primitive defenses of the Turkish forces in Palestine, consisting of sharpened stakes, steel hoops, and deep pits with stakes for impaling attackers

The Service of the Chemist

A Department Devoted to Progress in the Field of Applied Chemistry

Conducted by H. E. HOWE, Chemical Engineer

The American Rainbow

IT has been said that Americans are too prone to consider discussion the equivalent of productive action and, knowing our ability as well as our natural resources, to regard as accomplished any development which we agree we can make. The danger of sitting back, satisfied that an American rainbow has been put in the sky before it has been finally established there, seems such that attention may quite properly be called again to our new industry—American dyes. It has been much discussed and many millions invested in its development thus far but all we other Americans must keep informed regarding the needs else a return of old conditions may render the great effort of the past four years in vain. We have an excellent, healthy industry at present but it is not wholly beyond the diseases of childhood and may continue to need some care in the immediate future. Most of all it must have real, economic support.

So long as German propaganda, either intentional or innocent, continues to exist the real facts regarding American dyes must be emphasized. German propaganda is very much like organized politics. It continues work unabated while the reformer, satisfied with a temporary victory, turns to other things. That German dye propaganda in some form does exist, is not difficult to prove. Recently a garment was purchased in a reliable store and it bore a tag which explained that since the dye situation was so acute the store was unable to guarantee the colors used notwithstanding the fact that they were the best to be had in America. It was found that the store had never undertaken to guarantee any colors used in the class of garment concerned, that no effort had been used to determine the suitability of the dye in question, for the purpose, and no attention paid to the workmanship involved.

It may be said that today, with one or two possible exceptions, dissatisfaction with American made dyes may be traced to errors in use which means applying the dye in a manner for which it was not designed or manipulation incompatible with its structure. Dame Fashion is frequently to blame for this and rarely have the designers taken available colors into consideration when setting the fashionable shades. In an effort to obtain these shades on a variety of fibers all sorts of combinations have been employed. The wonder is that we have done so well.

Then, too, tests for dyes have been instituted under which original German dyes have failed to a greater degree than those made here while a wide range of American colors under exacting comparative tests have shown themselves to be fully as satisfactory or superior to the imported idol. When one recounts the efforts that have been made to hold a profitable market for Germany the ingenuity displayed calls for no little admiration.

While much was to be learned from the literature and patents this frequently was of the negative variety indicating how not to do it or a patent was drawn in a plausible manner but omitted the essential points. One patent is said to have described a process which if followed was sure to give an explosion, while often the crux of the problem was passed over with, "I then filter" after a minute description of other steps. The whole novelty and foundation of the process was in the exact procedure of filtering! So in the laboratory American chemists have made progress in four years nearly equal to the German work of two decades.

On previous occasions this page has carried references to the difficulties overcome in providing the industrial chemist with suitable large scale apparatus. Dye production is a conspicuous example of this for that industry uses enormous quantities of such corrosive chemicals as sodium caustic, nitric acid, sulfuric acid and chlorine products. There have been new apparatus to design and install, new dyes to be made, increased production and plant reconstruction to be carried on simultaneously.

Some dyes have been made for years in the United States but from imported intermediate materials. Now we have our domestic sources of raw materials and the plants for intermediates all progressing on a truly American scale, one aniline oil factory alone producing more aniline than was used in our country before 1914. In 1917 one hundred and eighteen firms engaged in producing one hundred and thirty-four intermediates from coal tar and its products totalling 322,745,858 pounds valued at $106,966,750, indicating what an important industry the preparation of raw materials for dyes, photo chemicals, pharmaceuticals and perfumes may become. Indeed nearly every intermediate is an industry in itself employing every operation known to industrial organic chemistry.

Notwithstanding the fact that the weight of American made dyes in 1917 equalled the pre-war importation and the value of the American made dyes exported in 1917 equalled the value of pre-war importations, there continue to be certain shortages which may be explained without in any way offering excuses for our accomplishments; for indeed no excuses are required.

Many things have gone to war and there are several stars in the service flag of the coal tar family. These may be named phenol, toluol, xylol, benzole and aniline. The production of these substances shows we have been diligently striving to keep up but explosives are more important than colors. Before the war our annual production of benzole was 4,500,000 gallons and of toluol 1,500,000 gallons. In 1917 these were increased to 40,200,000 and 10,200,000 gallons respectively. Phenol rose to 63,000,000 pounds but picric acid must be made. Now with war requirements in mind let us see how that affects our dye shortage.

The dyes most missed have been, perhaps, the indanthrenes, fast bright blues and fast violets. The indanthrenes are a wonderful series used on cottons because they withstand severe laundering and bleaching. They give beautiful shades which endure; but they are not only difficult to make—they require toluol as do the fast bright blues and violets so necessary for taupe shades. So does trinitrotoluol and we are all agreed that the color of our shirt is of no importance compared with high explosive.

Now with a shortage of material we must expect those shades to be made for which there is a large demand. There, too, the chemistry of dye manufacture has also kept ahead of man-power and apparatus facilities and the dye manufacturer has quite naturally turned to making the colors wanted in large quantity. A recent analysis shows about the following division in the demand for colors: Black 60 per cent, blue 25 per cent, reds five per cent, fancy shades 10 per cent. Is there to be any wonder that a shortage in fancy colors has existed? It has been important for the manufacturer to solve questions of yield, to increase purity and to standardize his product before seriously attempting any new dyes. He has been doing well for in January, 1915, but 16 colors were made here. We were producing within six months so that by 1916 the number had risen to 40. The year 1916 was an extremely active one and January, 1917, saw 150 colors made in the United States.

But what of the thousand shades of the Germans? We have seen that our shortage is not of quantity of good dye but in the variety of shades. Somehow we have never been greatly impressed by that catalog of a thousand shades. You may remember that King Solomon in all his glory had very few German dyes, and there are many dyers of the old school who can do very well indeed with natural dyes so it may be we have never required so many shades. The facts are that some of them were sold to find a return for certain by-products of the industry. Being made in Germany they got by with no questions as to merit asked. No wonder that before the war, we now know, Americans bought ten pounds of fugative to one pound of fast dyes, many German packages being lettered "Sold without guarantee." It is not economically possible at present to produce the relatively small amount of dyes of special shades wanted. When the more important needs are met then we will find these specialties supplied. It will be necessary to find uses for some of the substances produced with them before their price can be materially reduced.

The important part played by the natural dyes in averting a serious economic condition when a dye famine was threatened from March, 1915, to September, 1916, should not be overlooked. Synthetic dyes are usually spoken of as improvements upon natural dyes which they have largely displaced and yet before the war $25,000,000 was invested in the natural dye wood industry in our country. Today the sum has been increased to $50,000,000. Prior to 1914 some 100,000 tons of dyewoods were used annually to prepare the extracts required while now 150,000 tons of logwood and 50,000 tons of quercitron bark are used for blues, blacks and browns. Indeed, logwood remains the standard black for wools and worsteds and the synthetic color maker has constantly endeavored to produce a black dye having the excellent qualities of logwood combined with the reaction rapidity which gives production and therefore makes the synthetic coloring material preferred for much of our modern black dyeing. The natural dye manufacturer looks upon the synthetic product as a substitute of imitation or artificial substance and maintains that if the chemist were content to work as hard to understand the coloring matters of woods and vegetables as he is in an effort to improve upon nature a new era would dawn for color chemistry.

In other countries the government has usually been closely connected with the founding of a dye industry, either through subsidies or other forms of active assistance. Here that which has been accomplished has been by the efforts of corporations and individuals. But at this point it seems proper for the government to begin its work of standardization, research and special studies. For many years the Bureau of Chemistry has been interested in dyes used in food products with special reference to analytical methods, identification and the physiological significance of dyes. It is but logical now to extend this work to detailed investigations of natural and synthetic dyes, the materials from which they are made and the reactions involved in their manufacture. Accordingly facilities are being provided for small factory as well as laboratory work.

Some things have already been accomplished in the laboratory studies which Dr. Gibbs divides into processes, dye intermediates, dyes, medicinals and analytical. An entirely new field has been opened through work on cymene which is obtained from the waste sulfite liquors when spruce wood is converted into sulfite pulp for paper. This recovered material when nitrated forms an amine which bids to yield as many derivatives as does aniline. Some of these products have been made experimentally but no final tests have been carried out. When it is recalled that about two million gallons of cymene are available annually as waste product from sulfite mills the possibilities are distinctly interesting.

When the dye question was suddenly brought into being there were many who did not comprehend the complexity of the problem and who were easily able to show that dye manufacture was a one-nation business; that since our imports were roughly equivalent to but 25 cents per capita annually, American industry would do better to devote its energies to bigger things. But upon dyes so many industries depend that we all now recognize the value of an American dye industry. For example it has been synthetic dyes that have brought cotton fabrics into the better class textiles. It plainly devolves upon Americans therefore to support that industry. Notwithstanding the large profits realized during the past four years nearly all that money had been put into developing the business and it will take another five years to complete the industry. Research must improve the present product before new dyes can properly be introduced, men must be thoroughly trained in what is undoubtedly the most intricate and difficult class of chemical manufacture.

It has been said that if the textile industry had been willing to add four cents to each $100 cost on their product from the time, in the early eighties, when the tariff on dyes was lowered or removed, we would have been assured dye independence in 1914 and have been saved the rather high tribute exacted since then. It is well to have the ultimate consumer understand the situation and the necessity for favorable tariff conditions for ten years at least.

The advance and improvement shown justifies support; 1917 saw the first indigo made in the United States. Much needed colors are gradually appearing and others are in sight. It is a time for optimism and a time for loyalty to our American rainbow.

Chemical Statistics

STATISTICS may often seem very dry but they are necessary if an industry is to be really developed along sound lines. There has been no compilation of data that would assist the chemical industry so the task was undertaken by the American Chemical Society through B. C. Hesse with the financial aid of chemical manufacturers and the necessary coöperation of the Bureau of Foreign and Domestic Commerce. It was soon seen that the assistance of other government departments was desirable and eventually the Geological Survey, Bureau of Plant Industry, Bureau of Chemistry of the Department of Agriculture, the War Industries Board and Tariff Commission contributed to the work.

Beginning with a study of 20,000 invoices of chemical importations these were carded to give the name of the chemical imported, the amount in pounds, the value and the origin. The necessary raw materials will be indicated in the forthcoming report as well as where they may be obtained; where semi-manufactured or finished products have been imported it is intended to indicate what is imported, into what ultimate product they enter, and for what they are used. Later on exports may be tabulated in the same way and there can be no doubt as to the value of the work. American manufacturers will be able to analyze nearly any chemical manufacturing problem concerning domestic production economics, seriousness of foreign competition, etc.

The report in question will cover four thousand articles and will comprise three hundred pages. It is expected to go to print by January, 1919, if not before. The American Chemical Society has created a committee on Import Statistics which will continue the work and maintain the record up to date.

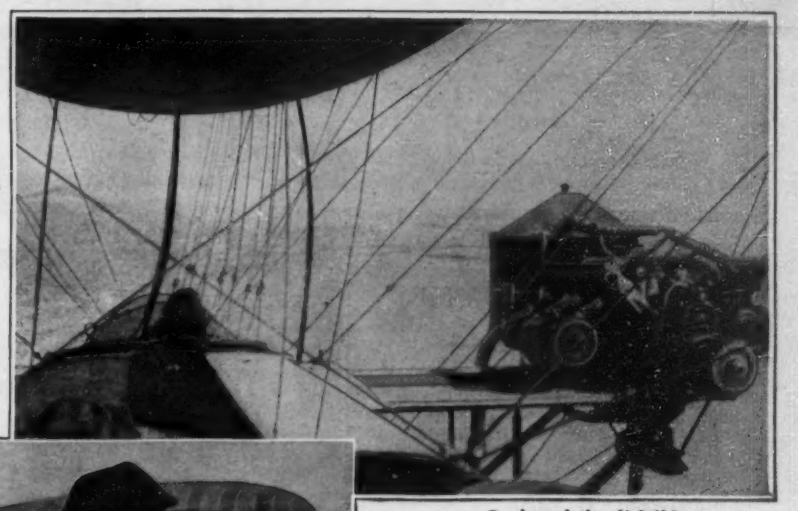
Rubber Vulcanizing Accelerators

IN recent years the use of organic compounds as accelerators in the vulcanizing of rubber has grown rapidly and hasled to the marketing of various compounds under trade names. Many of these materials are of a poisonous nature and the Rubber Section of the American Chemical Society appointed a committee to consider the situation and call attention to the dangers, and the symptoms of poisoning and the antidotes.

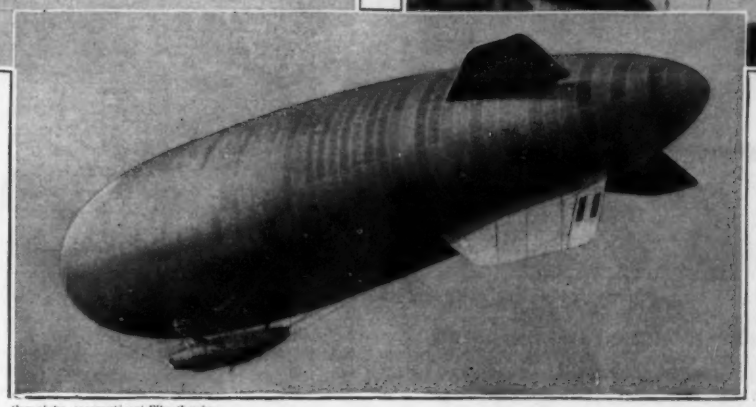
The more common accelerators are aniline, hexamethylene tetramine, para-phenylene diamine, para-nitrosodimethylaniline and thiocarbonilide. The report emphasizes the importance of cleanliness, washing the hands before eating, bathing, and changing clothing before leaving the plant, adequate suction hoods for the mixing mills, good ventilation, immediate attention to early symptoms, temporary change of occupation within the factory, periodical medical examinations and the insistence that, where trade names are employed, information be given as to the nature of the material or that steps be taken to determine with what the mixing and compounding departments are working.

Anything that is done to lessen occupational diseases directly benefits both labor and capital and is a distinct economic gain.

How a dirigible is packed



On board the dirigible



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Latest type of American dirigible in flight

Our Rapidly-Expanding Fleet of Dirigible Balloons

WHILE our airplane program is rapidly being realized in the form of thousands of machines and engines going across the ocean to our military and naval forces at grips with the enemy, we have been building a large fleet of kite balloons and dirigibles for our lighter-than-air section of aerial warfare. The work of turning out these fantastic craft has been devoid of the spectacular, to be sure; but the results have nevertheless been signally successful.

Starting first with the "Blimp" type of dirigible for U-boat operations, we have turned our attention to a larger dirigible of increased speed and greater range than the little dirigibles with their airplane bodies. Our latest type is 162 feet long and is equipped with two 150-horse-power Hispano-Suiza engines. It is said to make a speed of 65 miles an hour, which is rather a big step forward for lighter-than-air craft. Dirigibles of this type are used to patrol the coasts and territorial waters both here and abroad, and possess distinct advantages over airplanes and seaplanes in this particular work. It appears that the matter of transportation has been given careful consideration. Our latest dirigibles fold and pack away into handy bags, as shown in one of the accompanying illustrations, making them available for use in any theatre of war.

Our Aerial Gunners in the Making

EVER since military aviation took on the form of a continuous struggle for the mastery of the air, with constant battles between airplanes and more recently between fleets of airplanes, the matter of aerial gunnery has become a matter of cardinal importance. Indeed, today aerial gunnery is second only to flying skill, in the training of airmen for aerial work.

Out at the famous North Island flying field in California is located the Aerial Gunnery School where our Army airmen are trained in aerial markmanship. There the students are trained in the art of handling the machine gun under actual flying conditions in special two-seater fighting planes. The student begins his course by shooting at clay pigeons and progresses step by step until he is sufficiently skilled to try his hand over the lines in France.

Much of the aerial gunnery practice is obtained with the machine-gun camera of the type shown in one of the accompanying illustrations. This device is practically a copy of the Lewis gun and is mounted on a standard fighting-plane rest. But instead of firing bullets at the friendly machine acting as the opponent, this device merely records the hits on a photographic plate. The camera member is fitted with a long-focus lens which photographs only that part of the traget which would have been hit were the gun a real Lewis. When the student comes down and the plates have been developed, it is soon possible to ascertain what "damage" he has inflicted on the "enemy."

More recently there has been introduced a so-called target machine, a diminutive airplane, which flies without a crew and which is employed as a target for aerial gunnery practice. It flies in circles until the fuel is exhausted.

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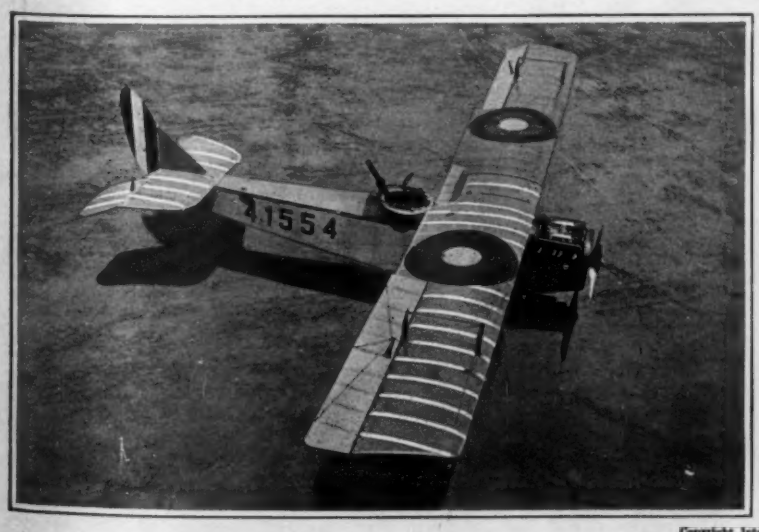
Cementing the seams of an American kite balloon

The Current Supplement

DURING the present century astronomers have devoted a great deal of attention to the extension of our knowledge of the stellar universe, and among the problems of importance connected therewith that it has been necessary to study carefully is the distance of the various stars from the earth, and from each other. A paper in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2237, for November 16th, on *The Determination of Stellar Distances* deals with this question, and reviews the various methods that have been employed. Great quantities of surgical dressings are now required in the many hospitals and surgical stations, not only in the war regions of France and Belgium, but also in the home institutions where the injuries of the fighting man are treated, and the world is being ransacked for suitable material in the necessary quantities. Among the new materials that have been developed by the necessities of present conditions is Sphagnum moss, which, although not unknown before, has, on account of its excellent qualities, and the magnitude of the possible supply, sprung into importance. An extremely interesting article entitled *Are You Collecting Sphagnum?* tells all about this little known moss, where it is obtained in this country, and how it is prepared for use. Some illustrations make the explanations lear.

Since the first "tank" was launched against the invading Hun about two years ago, a number of modifications of the original design have appeared. Short descriptions of the various machines mentioned in the reports of the war operations, telling about their general features, will be found in *Mechanical Cavalry*, which is accompanied by excellent illustrations of the different styles mentioned. We have received a number of reports of airplanes of immense size that have been recently brought out by the Germans. *The Zeppelin Biplane* gives an extended abstract of a technical description of these monsters, by a French expert, together with a number of explanatory diagrams. *Die-Casting of Aluminum Bronze* gives much valuable information in regard to a process that is now having wide application. *A Nursery of Broken Ships* supplies some interesting information about the salvage of ships sunk by U-boats. Other articles include *Four-Cycle versus Two-Cycle Diesel Engines* and *Respiratory Diseases in the Army.*



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Two-seater fighting machine employed at the Aerial Gunnery School for the training of aerial gunners

The machine-gun camera which records the "hits" on a photographic dry plate

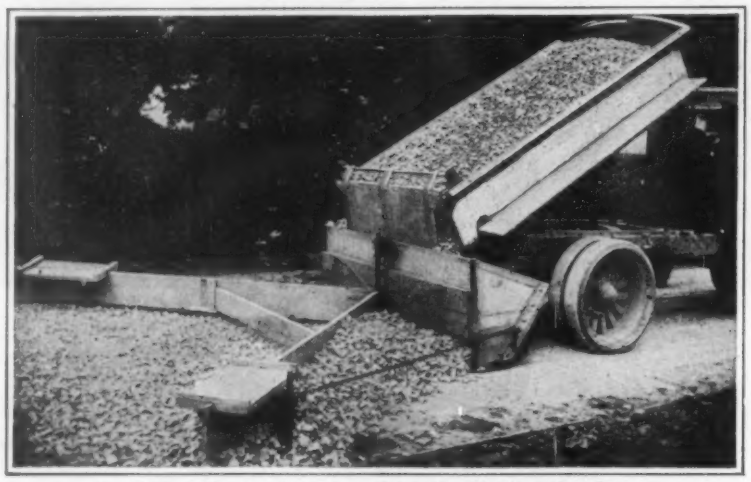
The Motor-Driven Commercial Vehicle

Conducted by VICTOR W. PAGÉ, M.S.A.E.

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The editor will endeavor to answer any question relating to mechanical features, operation and management of commercial motor vehicles

Labor-Saving Rock Spreader

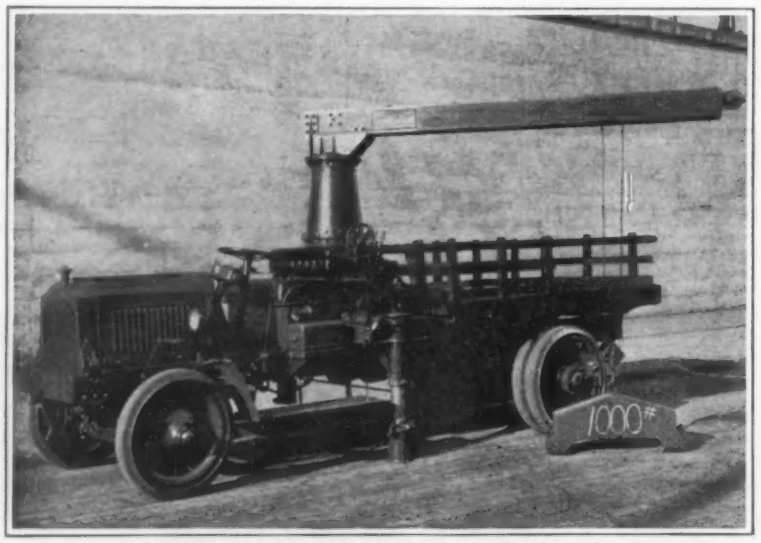
BESIDES being a money saver the stone spreader shown herewith is a great saver of labor. In these days every contractor finds it not only hard to get men, but when possible to get them the expense is very great; hence it is very necessary to find a mechanical means of doing this work. The usual method in road building is to deliver the rock in trucks and dump it at regular intervals along the way. Then the rock is spread by hand, the men guessing at an even distribution as they go along. The machine, which is attached to the rear of a motor truck, can be regulated so that the necessary depth of rock can be spread uniformly and accurately. The machine is seven feet four inches long so it can be used with any truck. When the road is narrow and will permit of only one drive, a drag is used which spreads the stone a couple of feet on either side. No stone need be hauled from one place to another. If the machine is set right the distribution is even. Because of this uniformity in the spreading of the stone material is saved as well as labor. One contractor claims that he saved the price of his spreader on a single job of a little over two miles.



A spreader that insures an even distribution of rock

A Crane Hoist That is Different

A NOVEL crane hoist, one of the first of its type to be mounted on a motor truck, has just been delivered to the United States Marine Corps. The apparatus consists of a ten-foot boom mounted on a hollow steel mast. The hoist and slew, either to right or to left, are operated from the standard power take-off. This is manipulated by a hand-lever in the center of the floor board, within convenient reach of the truck driver. The radius adjustment of the hoist load is operated by a hand-wheel at the side of the driver's seat. At 7½ foot radius the lifting capacity is two tons, and a ton and a half at ten feet. Two substantial ratchet jacks mounted on the sides of the truck chassis to relieve the frame from strains when the truck is in use, are shown in operation in our cut, and constitute a somewhat novel and altogether admirable accessory.



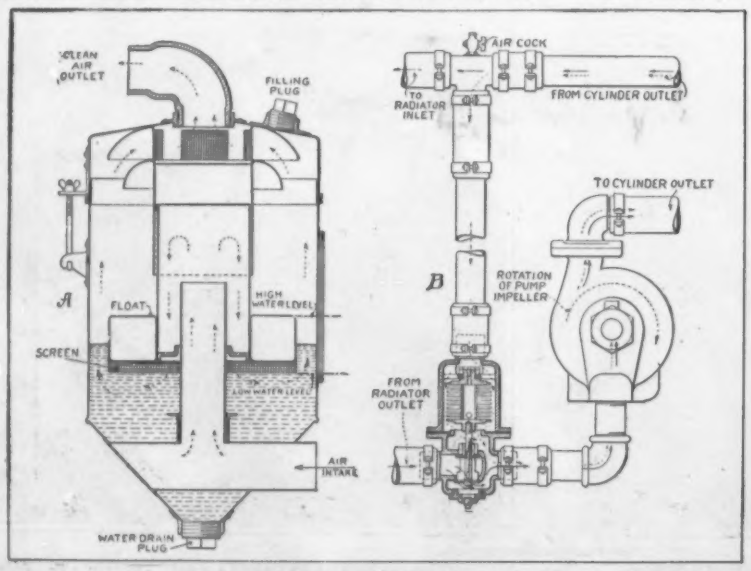
Novel crane hoist with a 10-foot boom built for the U. S. Marine Corps

Tractor Power Plant Improvements

A TRACTOR usually operates under conditions that produce a cloud of dust about the mechanism and unless special precautions are taken the air inspired into the carburetor is apt to be full of dirt and grit which not only promotes deposits in the combustion chamber interior but also causes considerable mechanical depreciation. An improved type of air washer is shown at A in the accompanying illustration. This is the type in which the air is passed through a water chamber and actually washed before it is sucked into the engine. Of course, water will be used up in this process, so a float controlled stack insures that all air must pass through the water as indicated by the arrows. In addition to the water, the air must pass through screens as well, so the water that may be present in the form of globules is effectively broken up and no dirt can be drawn into the engine. This insures clean, moist air, very desirable for engines using kerosene carburetors, and also reduces scoring of the cylinders and wearing of the rings of the piston. A glass water gage is provided so the operator can make sure there is an adequate supply of water at all times.

The other device shown at B is a thermostat for controlling the water temperature and preventing overcooling of the engine. This is very important when kerosene is used as the engine is kept just hot enough to prevent condensation of the fuel and the unvaporized liquid cannot find its way into the crankcase interior and dilute the lubricating oil. Its operation is very simple, the function of the thermostatically controlled valve being to allow water to bypass without going to the radiator if the engine is running too cold.

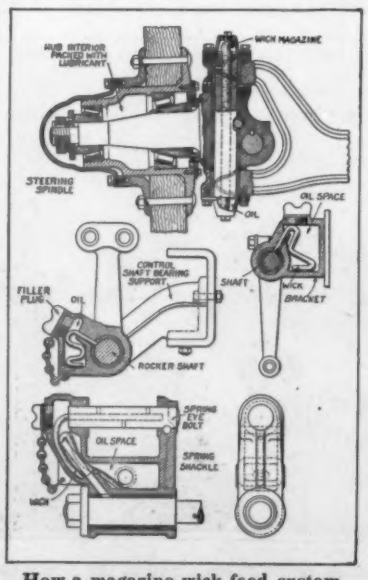
Heat control is a feature that is being used in a number of automobiles and it can be used to just as good advantage in tractor construction.



Air washer to remove dust from air supplied to the carburetor, and thermostat to insure uniform water temperature

Improved Oiling System for Truck Chassis Parts

THERE is one point that is just beginning to receive the attention it deserves on the part of builders and designers of motor trucks and that is the provision of automatic or at least semi-automatic oil lubrication for a number of the chassis parts that were formerly lubricated by compression grease cups. The disadvantage of grease cup lubrication is that the lubricant hardens in the oil passages and in many cases does not flow to the bearing point it is intended to protect. Oil lubrication is superior, if properly carried out. Reservoirs may be provided, as shown in the accompanying illustrations, which will hold a sufficiently large quantity of oil so that if distributed by some form of wick feed, as outlined, there will be but little possibility that the bearing surfaces will run dry, even though the truck operator should forget to supply oil at regular intervals. The central supply system that has been embodied in a certain foreign passenger car in which oil is led to all bearing points of the chassis and circulated to all these points by means of a pump, is somewhat too expensive to apply to the usual motor truck construction. Fortunately, oil will feed very well by capillary attraction, so that the magazine wick feed system is a thoroughly practical one. The main features of this system are a series of hollow spring brackets and shackles for the spring retaining bolts and magazines attached to the bearings or supports for the various rocker shafts. These spaces are filled with oil and in order to prevent wastage, as will be the case with direct gravity feed, the oil is distributed by felt wicks about one-quarter inch in diameter which feed from the bottom of the pocket and carry the oil through drilled passages to the bearing surfaces. It is state that these cored brackets hold oil enough to last from six to eight weeks. In this way constant lubrication of points that are usually neglected may be assured.



How a magazine wick feed system of oiling is applied

The Oil-Cooled Kerosene Engine

EVERYBODY knows that kerosene is a perfectly good fuel; but every automotive engineer knows that there are difficulties in the way of his using it. If he could burn it in the liquid form, as the housewife has been doing these many years, all his troubles would be solved; but he cannot so burn it. He must burn it much more rapidly than the housewife does, so that he will have, not merely a flame, but actually an explosion; and to effect this he must first vaporize it. Otherwise the molecules are not far enough apart to get into the instant and immediate relation with the oxygen that alone can cause explosion.

This is the fundamental basis of the woes that beset the man who tries to find a substitute for gasoline. If he is to vaporize his fuel before combustion, he must do so by addition of heat. He can supply this heat in several ways, but all of them cause complications. In general the problem is that of controlling the heat supplied to the fuel mixture in accordance with the instantaneous load on the engine. This problem, however, must be solved; for at low engine speeds and low engine loads the fuel is less effectively comminuted, so that a higher degree of heat is required for its vaporaization than would be in the case with a full load or a high speed—while the exhaust, which is ordinarily called upon to supply that heat, is at a much lower temperature.

A recent suggestion is that the fuel be introduced into the cylinder cold, and heat abstracted from the cylinder walls for its vaporization. This in itself is not new; but the means of making it practicable in a kerosene engine is. It is obvious that where water cooling is employed the suggestion is not practicable, for the water keeps the temperature of the cylinder wall down to 100 degrees C.; and it is not possible to draw from the walls, at this temperature, heat to raise the fuel to its vaporization temperature of something like 250 degrees.

This condition has therefore brought about the introduction of oil cooling in tractor engines. Mineral oils can safely be heated to the point mentioned, and oil at this temperature in the cooling jacket will not alone make certain the complete vaporization of the globules of fuel introduced into the cylinders, but will likewise decrease the amount of heat absorbed from the jacket by the burning charge, by reducing the temperature difference between the opposite sides of the cylinder wall.

The experiment thus outlined has actually been tried in several cases in tractor engines, and will apparently become more general as its advantages become more generally known. It remains to be seen whether the procedure thus opened up holds forth any hope to the motor truck man who is seeking a substitute for the expensive gasoline fuel. It is apparently given him to hope that kerosene will eventually be for him.

About Dollars and Gears

This Torbensen talk is about saving money. You may consult engineers as to the mechanical efficiency of different types of truck drives, but what you yourself are interested in will be the *commercial* efficiency; that is, the relation between the *ton miles of service* and *the cost* of gasoline, oil, tires, maintenance and depreciation. The following paragraphs will show you why Torbensen Internal Gear Drive is so economical to operate and maintain.

Savings in Gas and Oil The reason why the ablest truck engineers have adopted the Torbensen Drive may be summed up in this bare statement:—The Torbensen Internal Gear Drive loses through friction the smallest amount of engine power at all speeds and loads of any form of truck drive.

The little pinion within the internal gear *rolls*—other types of gears have a sliding action. The friction in rolling contact is much less than in sliding contact and absorbs less power. Saving power means lower costs for gasoline and oil.

Savings in Tires Tires are a big item of truck upkeep cost. One of the biggest tire manufacturers has made precise tests which prove conclusively that one pound carried on the axle without springs will cause as much tire wear as nine or ten pounds carried on the rear axle springs.

On a one-ton truck, the Torbensen rear axle weighs 365 pounds, while another design of truck axle of the same carrying capacity weighs 750 pounds. This gives Torbensen an advantage of 385 pounds less unsprung weight. This means that the other form of truck drive involves a tire expense when operated without load as great as the Torbensen equipped truck carrying 3465 pounds of payload.

The Torbensen equipped truck will give very much greater tire mileage than the truck which has the heavier axle. The heavier axle will pound itself into the repair shop or scrap heap long before the Torbensen axle shows undue evidence of wear and tear.

Savings on Repairs Speaking of repairs, compare the Torbensen Axle with any other form. Note how all revolving parts are protected by roller bearings or ball bearings which will wear for hundreds of thousands of miles. No chains or sprockets exposed to the dust and dirt, and no gears with sliding tooth contacts which can be ruined completely by operating five minutes without oiling. We certainly do not want to encourage neglect, but the Torbensen axle will stand more abuse in the way of lack of lubrication and overloading than any other form of axle.

Note Torbensen accessibility. The inspection cap can be taken off the differential housing in three minutes, enabling you to inspect the differential and bevel gears. See how easily the jack shaft and pinion can be removed. With some axles it is necessary to remove the axle from under the truck to enable you to examine the differential.

There are more Torbensen Internal Gear Drive axles in service than any other commercial car truck axle ever built. Any man who is familiar with one size is able to adjust and repair any size, because they are all similar. Mechanics know the Torbensen axle and can repair it quickly and economically.

It is these basic economies of a Torbensen Drive—savings on gas and oil, savings on tires, savings on repairs, which have made us the largest builders in the world of rear axles for trucks.

THE TORBENSEN AXLE COMPANY
CLEVELAND, OHIO

Largest Builder in the World of Rear Axles for Motor Trucks

TORBENSEN INTERNAL GEAR TRUCK DRIVE

RECENTLY PATENTED INVENTIONS

Pertaining to Apparel

SHOE FASTENER.—E. E. HILLS, Medina, Wis. The object of this invention is to provide a fastener for connecting the flaps of a shoe, which will simulate the usual lacing, and wherein a series of clasps is provided for each flap, each clasp consisting of a substantially U shaped member or yoke comprising a body and arms, the arms of each yoke having eyelets for engaging the eyes of the flap, and the bodies of the yokes having interengaging means for connecting the yokes.

A PERSPECTIVE VIEW OF SHOE WITH FASTENINGS IN USE

NECKTIE AND COLLAR.—J. D. MCOSKER, 733 Cambridge St., Brighton, Mass. This invention relates to an imitation knotted four-in-hand tie and a collar especially designed for holding the tie. The object is to produce a ready-made tie which, when worn has the appearance of an ordinary four-in-hand, to provide a simple one-piece form around which the tie may be built, to provide a band which forms the front or knot of the tie and means of fastening the tie to the collar, by an attaching member and extra buttonhole in the collar.

SPRING PUTTEE.—E. KAUFMANN, Park Ave., cor. 129th St., New York, N. Y. The invention relates to leggings or puttees such as are commonly worn by soldiers; it particularly refers to a type of puttee in which the main portion of the body is of one piece of relatively rigid material fastened by a spring member which serves as a locking member in connection with the flap. Among the objects is to provide means to prevent the point of the spring from abrading the facing material of body of the puttee at the socket into which the point of the spring is inserted.

Pertaining to Aviation

AIRSHIP.—J. D. SALTS, Bois D'Arc, Mo. The invention has for its object to provide a device wherein a car is provided supported by a gas bag or bags, and by planes arranged at the car and at the gas bag, to swing in unison to assist in supporting the car and in guiding it vertically and laterally, propellers being provided which may be swung laterally to assist in guiding the car, and wherein a type of engine is provided which may be operated by gas or by compressed air.

Electrical Devices

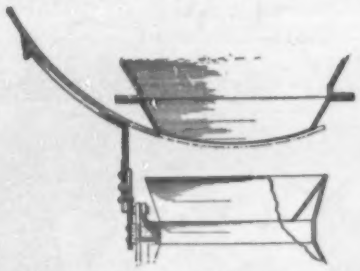
BATTERY COVER.—C. W. TAUBE, 2516 N. Cal. St., Chicago, Ill. This invention relates to fluid batterics and has particular reference to a vented cover so constructed as to allow the gases to escape that are generated within the battery jar and yet prevent leakage of the fluid or electrolyte in the event of the overturning of the battery. Among the objects is to provide a battery cover especially adapted for aeroplane or like service where the tilting or inverting of the battery is liable to occur.

Of Interest to Farmers

HARROW TOOTH.—H. M. GODING, R. 4, Attica, Ohio. The object of the invention is to provide a spring tooth for harrows and cultivators which may be manufactured at little cost, and which will offer a constant and even yielding pressure when the harrow is operated, not only when the harrow tooth is in normal position, but also when it is pressed rearwardly by contact with an obstruction. Another object is to provide yielding means to check the rebound of the tooth after passing over an obstruction.

Of General Interest

AUTOMATIC SCALE.—B. P. DOTTERER, 236 Ashley Ave., Charleston, S. C. The object of the invention is to provide mechanism in connection with a scale for use with a gravity discharge, having a gate or door normally moved into closed position wherein means is provided by the



DRAWING SHOWING MECHANISM

scale as it is depressed by the load for tripping the gate holding mechanism to release the same when the predetermined weight is almost reached to permit the gate to partially close and for afterward tripping the releasing mechanism to permit the gate to completely close when the predetermined weight is reached.

CALENDAR.—A. B. CRANE, 759 Summer Ave., Newark, N. J. The invention relates to a pad calendar which will present in large figures the numbers of the days in a month and in small figures the number of days in a year. An object is to provide a card back of the pads showing a year or more with large and small numbers for indicating the days of the month and the number of the day in the year.

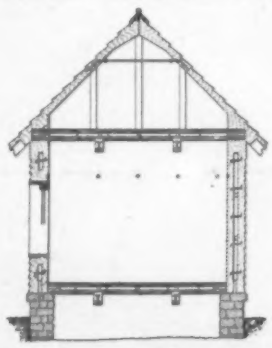
AUTOMATIC TRAP FOR RATS, MICE, AND WILD ANIMALS.—A. VALENZUELA, Valparaiso, Chile. The objects of this invention are to secure, first a permanent working trap divided into three compartments, capable of trapping one after the other a number of rats or wild animals, second, to procure an effective trap, able to catch rats or wild animals according to size and resistance of materials employed, third, to supply a device able to catch alive the greatest possible number of rats and animals, and with the least danger in case of wild animals.

PAPER CLIPPER.—R. F. WENTZ, address Fred E. Geiser, Easton, Pa. The invention relates particularly to a cutting device which may be associated with a pencil in order to be convenient at all times for cutting out sections from paper, as for instance an article from a newspaper, the object being the provision of a construction whereby any part of the paper may be quickly and easily cut out along a given line and may start at any point on the paper.

DOOR SCREEN.—B. B. PERKINS, care of Midway Gen. Hospital, 389 N. Snelling Ave., St. Paul, Minn. The invention is more particularly intended for embodiment in door screens, it relates to the type of screen in which inlet openings are provided to the interior of the screen, for the entrance and trapping of flies. An object is to provide means for emptying the screen of the dead flies.

SAD IRON.—J. PURETZ and B. COHEN, 62 E. 8th St., New York, N. Y. An object of the invention is to provide a sad iron having a detachable ironing plate provided with means entering the hollow of the iron and subject to the direct attack of the flames of a burner. Another object is to provide a plate which permits a free access of air through the bottom of the hollow of the iron so as to facilitate combustion within the iron and thereby increase the efficiency of the burner.

HOLLOW SLAB BUILDING STRUCTURE.—J. T. CARROLL, care of State Capitol, Helena, Mont. This invention relates to concrete or cement gypsum buildings, its general object is the construction and method of manufacture of hollow



VERTICAL SECTION OF BUILDING EMPLOYING THE SLABS

slabs so that they can be made of any desired form or design, and so constructed that the building structure made thereform will have the advantage of being fireproof and practically indestructible, the walls, floors, and ceilings being provided with a large dead air space which guards against the extremes of cold and heat and against moisture.

DETONATING BLASTING FUSE.—G. G. DORMER, Virginia, Minn. The invention relates to burning fuses utilized for blasting purposes. An object is to provide a fuse which has means at suitable intervals in the body of same adapted to produce a detonation which serves as a warning of approximate explosion to be caused by the burning of a fuse. The charge of detonating material is incorporated in the core of the fuse and protected from the effect of the atmosphere by the material which houses the core.

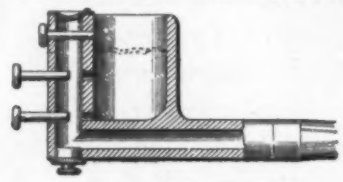
PAPER CLIP.—J. FRITZ, care of The Fritz Faber Mfg. Co., 11 No. Water St., New Bedford, Mass. One of the main objects of the invention is to provide a relatively large and strong prong which, after being forced through the apper, is deflected and permanently seated in a pocket, and another object is to provide relatively small supplemental prongs adapated, after having passed through the paper to be seated in indentations to prevent interal movement of the plate members of the clip with respect to the paper and to each other.

SWING.—E. R. PITTI, Boyd, Mont. This invention relates generally to swings and more particularly to children's swings, the object being to provide a simple and attractive device which may be readily taken apart for storage purposes and if desired, readily dismantled whereby its detachable parts may be packed within minimum space.

CONCRETE CULVERT MOLD.—J. S. MCCABE, Minneapolis, Minn. The invention comprises supporting arches formed of curved angle bars a plurality of lugs carried thereby, each of the lugs being secured to the outstanding flange of the arch and having an inner enlarged end abutting the lateral flange of the arch being provided with a hook projecting beyond the arch, and a plurality of flanged mold plates, the flanges of which are engaged by the outer hooks of the supporting lugs.

CONVEYOR.—J. L. WENTZ, 245 Pauleson Ave., Passaic, N. J. Among the principal objects of the invention are to provide a portable conveyor having self-actuated means for supplying the material to the conveyor, to prevent the outer edges of the conveying belt from sagging between the rollers supporting the central section of the conveying belt, to prevent the load carried on the belt from traveling downward on the conveyor, and to avoid accumulation of material between the top and bottom extensions of the belt at the receiving end of the conveyor.

PIPE.—A. D. GILBERT, Dunseith, N. D. The invention has for its object to provide a pipe wherein a smoke chamber is provided at one side of the tobacco chamber with which the tobacco chamber communicates by a series of openings, and wherein means is provided for plugging the



A LONGITUDINAL SECTION

openings, the smoke chamber having also removable ends to facilitate cleaning. In use when the pipe is filled and tobacco lighted all the plungers are withdrawn, as the tobacco burns down each plug is closed in turn, the moisture from the burned tobacco is decreased and the stem prevented from clogging up.

VEGETABLE GLUE OR ADHESIVE.—R. W. TUNNELL, 15 No. 5th St., Philadelphia, Pa. An object of the invention is to provide an adhesive which is suitable for all classes of work to which vegetable adhesives are applied. Another object is to provide a method of obtaining the product which is inexpensive, as it eliminates the machinery necessary for hydrolyzing the starch, in addition to the labor connected therewith. The adhesive is formed by mixing low and high grade tapioca, and adding an alkaline earth hydroxide thereto, and treating the same with water.

PHOTOPRINT ADJUSTER.—L. L. STEVENSON, 528 Commercial St., Emporia, Kans. The main object of the invention is to provide means for instantly, automatically and accurately adjusting the print paper upon the negative, the adjusting means being of relatively great thickness when free from pressure though of actually slight thickness when under pressure due to their peculiar and novel formation. The device can be used in an ordinary printing frame, with or without a mask.

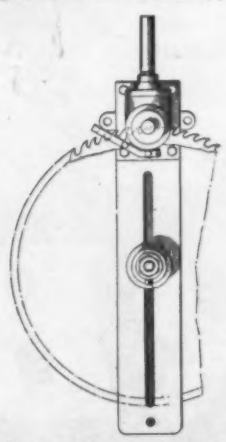
CLEAN-OUT.—F. SCHUH, 414 Rutherford Ave., Trenton, N. J. The invention relates to sanitary apparatus such as water closets, sinks, traps and the like. The object is to provide a clean-out, arranged to prevent the escape of odors or liquids. To accomplish this result use is made of a water jacket surrounding the clean-out openings, the water jacket being connected with a water supply and having an outlet leading into the bowl or other part of the apparatus.

SEA MINES OF STEEL-CONCRETE.—N. K. FOUGNER, Christiania, Norway. The invention has for its object a floating or submarine mine of steel concrete. In accordance with the invention the hollow mine bodies are produced by means of a lathing of metal net or perforated sheets of metal, mounted on a form of metal or wood. On the outside of the metal lath is placed a layer of cement, to which is added materials adapted to make the cement watertight.

TIME OR DATE STAMP.—R. WILDAY, 87 Duane St., New York, N. Y. A specific object of the invention is the provision of a date stamp including a handle with a stamp head or cushion, with a rotatable spindle within the handle and having means for holding an arrow alone or with date stamp type, there being novel means for permitting the adjustment of the spindle, and means frictionally holding the same in adjusted position.

Hardware and Tools

SAW SET.—I. O. STUVLAND, 2926 Maple St., Everett, Washington. The invention has for its object to provide a device especially adapted for setting saws of the circular type, wherein



TOP PLAN VIEW OF THE DEVICE

a support is provided for the saw upon which it may be rotated, and means for setting the teeth at the proper angle as they are brought into position at the said means, other means being provided, controlled by the setting of the teeth, for advancing the saw.

SAW HANDLE.—M. RUTH, 91 Wilkinson Ave., Jersey City, N. J. This invention deals particularly with adjustable handles, whereby the handle can be set at 90 degrees to the plane of the blade, or in the same plane with the blade. A specific object is the provision of a form of hinge between the handle and the plate to which the blade is riveted, such handle having yieldingly connected members for permitting the interchange of clutch teeth on the eyes of the hinge, the pintle of the hinge being in the form of a bolt which is tightened to cause the teeth to be firmly interlocked.

LOCK.—M. BAKST, 101 Bowery, New York, N. Y. The special object of the invention is to provide a mortise lock for use on house doors and the like, arranged with a number of simultaneously actuated bolts to permit of securely locking the door against opening by burglars, and other unauthorized persons. Another object is to provide a lock which is simple, durable, and not easily liable to get out of order.

Heating and Lighting

PLANT FOR UTILIZING WASTE HEAT.—R. D. MARTIN, First National Bank Bldg., Ft. Smith, Ark. The invention relates to a steam plant which can be easily controlled to utilize the waste heat generated by coke ovens. An object is to provide a plant formed of a series of small steam units, each unit receiving the waste heat from a series of coke ovens and whereby any of the steam plant units may be cut out without affecting the entire plant.

SPARK TIP.—G. A. H. HENRIX, 646 N. Clark St., Chicago, Ill. The invention relates to devices for lighting gas and like purposes, and involves a spark tip functioning when subjected to the action of an abrading element such as a file. The device includes a plug of sparking material, and a holder therefore consisting of a metal shell molded and shrunk onto a plug for a portion of the length thereof, the interior surface of the shell conforming to the uneven external surface of the plug.

DRIER.—A. W. LISSAUER, care of E. Horwitz, 115 Broadway, New York, N. Y. An object of the invention is to provide a drier whereby the material placed therein can be dried thoroughly without supplying heat directly to the drier. Another object is to provide a drier in which the air coming from the drier can be mixed with the atmospheric air and again through the drier, thereby obtaining a better efficiency in the drying in utilizing the moisture present in the air which came from the drier.

AIR REGISTER.—E J. MALLEN, 2328 University Ave., Bronx, N. Y. The invention relates to registers for hot air heating systems, and has reference more particularly to a register having a plurality of relatively movable vanes. An object is to provide a register in which the adjacent vanes move in opposite directions, and in which the movement of the vanes from closed position may be regulated to obtain the desired speed or velocity of air.

Machines and Mechanical Devices

SEWING MACHINE ATTACHMENT.—A. KURTZ, 10 Sackman St., Brooklyn, N. Y. Among the principal objects of the invention are to provide for feeding in independently guided relation a plurality of materials or layers of material in the path of the needle of a sewing machine, which means permits of turning or deflecting the material so that the needle follows a curved or sinuous path, to provide for delivering between the layers of the material when being sewed, a filling member, and to arrange the attachment referred to so that it may be disconnected to permit the ordinary operation of the machine.

SCREWING MACHINE.—G. H. WHITEHOUSE and A. COOK, West Bromwick, England. This invention relates to screwing machines of the type wherein the screw thread is cut by a chasing tool, and comprises means for advancing the tool for the thread cutting action and for its rapid withdrawal from the work piece and return to the starting position.

MACHINE DRILL.—C. E. COX, 726 W. 9th St., San Pedro, Cal. The present invention relates to an improved latch means and to spring acted controlling means, therefor, as well as to the manner of effecting the engagement between the latches and the spindle, the purpose being to improve the latch means and controlling means with respect to durability and to insure a positive operation of the latches in an effective manner.

REVERSIBLE HYDRAULIC WELL DIGGING MACHINE.—H. N. LATTA, Valentine, Neb. The invention relates more particularly to means for creating a continuous suction in the drill tube. An object is to provide an apparatus including an automatically operating plunger arranged to act when the cranks pass the dead centers, at which time there is a tendency toward a breach in the continuity of the fluid stream, to create an auxiliary suction in the pipe and prevent the break in the fluid stream.

HAND LOOM.—A. N. SHOOK, 41 W. 36th St., New York, N. Y. Among the objects of the invention is to provide a hand loom particularly designed for rapid and satisfactory use when positioned upon a table or the like. More definitely stated this mechanism provides a loom so constructed that the beater, even though it constitutes a part of a machine which occupies a minimum amount of vertical space above the table or support, yet may be operated for beating purposes through a wide space with respect to the longitudinal movement of the fabric being woven.

OIL OR ACID PUMP.—W. W. HUDSON, 802 2nd Ave., Salt Lake City, Utah. The invention relates especially to those machines

(Continued on page 400)

— as Transportation Makes Greater Demands Upon the MOTOR TRUCK

Republic nation-wide service is a big advantage

Greater demands are constantly being made upon motor trucks everywhere. Transportation needs are urgent. Every truck must be kept at work day-in and day-out. Each truck must be made to haul every ton of freight that it is capable of hauling.

Republic Nation-wide Service makes this possible for the owners of Republic Trucks.

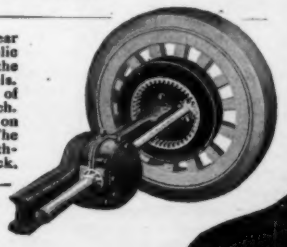
There are more than 1300 Republic Service Stations, distributed all over the United States, making Republic Service available to Republic Truck users in city and country alike.

Republic Service is uniformly dependable. Each Republic Service Station is interested in keeping every Republic Truck in its territory working at highest efficiency at all times.

It is this conscientious service together with the quality built into all Republic Trucks that is responsible for Republic attaining the leadership in the entire motor truck industry within five years. Last year Republic built and sold more than twice as many trucks as the next largest manufacturer.

There is a Republic Truck to meet every hauling requirement. Seven Models—¾ ton to 5 ton. The Republic dealer will help you decide which model will best meet *your* needs.

Republic Motor Truck Co., Inc., Alma, Michigan



The Torbensen Internal Gear Drive used in all Republic Trucks, delivers 92% of the motor power to the wheels. We know of no other type of drive that delivers as much. The entire load is carried on a separate I-beam axle. The driving mechanism has nothing to do but *drive* the truck.

REPUBLIC

Internal Gear Drive

MOTOR TRUCKS

Built by the Largest Manufacturers of Motor Trucks in the World

RECENTLY PATENTED INVENTIONS

(Continued from page 398)

which are designed to be used in ore flotation processes. An object is to provide a device which has a constant stroke, but which may be made to deliver any quantity of liquid from a minimum to the full capacity of the machine, the machine is so constructed that it may be adjusted quickly even when in motion.

SAFETY DEVICE FOR ELEVATORS.—W. C. MURPHY, Bear Creek, Mont. The invention has for its object to provide a device adapted for elevators of every character, mine cages and the like, for preventing downward movement of the elevator or cage in case of breakage of the hoisting cable. Should the cable break, the device is provided with dogs which becoming released wedge between the ends of the cross bar and the guides, thus blocking further downward movement of the cage.

FLEXIBLE SHAFT.—E. E. LARSON, Thompson, Iowa. An object of the invention is to provide a shaft consisting of a number of universal joints formed of few parts, and which can be easily assembled by machinery. A further object is to provide a flexible shaft which can be easily repaired, extended or shortened without need of machinery.

WELL DRILLING MACHINE.—W. C. SOLE, 114 N. Frerick St., Petersburg, Ind. Among the objects of the invention is to provide a mahcine which combines the good qualities of the stationary and portable well drilling machine. This machine is provided with three sheaves disposed above each other, and three reels, so that the casing line, the drilling cable, and the sand line are permanently installed, the casing line and sand line being secured at one side when drilling but being in a position which admits of their almost instant use.

PACKLESS ANTIDRIP VALVE.—J. C. SMITH, care of Foster Milliken, 55 John St., New York, N. Y. This invention relates particularly to a valve which may be quickly operated and which dispenses with the usual packing necessary to make the same leak-proof. An object is to provide the device with a gasket and associated parts for producing a tight connection continually, and to provide a washer and a spring to give an even tension whereby leakage is prevented during the up and down movement of the valve when in operation.

SWIVEL FOR USE IN WELL DRILLING.—J. CROWDER, Avoca, Ireland. The invention relates to swivels which are used to connect the drilling tool with the wire rope by which the tool is raised and lowered in the bore of the well. The object is to provide a swivel the body of which, while capable of being made in a single piece, is so constructed as to avoid the necessity of passing the rope downward throughout the whole length of the swivel-body and out through the tool-socket.

MULTIPLE COPYING LATHE.—G. A. ENSIGN, Defiance, Ohio. The object of the invention is to provide a copying lathe more especially designed for turning gun stocks, shoe lasts and other articles of regular or irregular form, and arranged to permit of producing at least two like articles at one operation of the machine. Another object is to permit the operator to accurately and quickly center one end of the remotest piece of work relative to its head stock spindle.

HULLING MACHINE.—C. SCHAFLER, Merida, Mexico. The object of the invention is to provide a hulling machine especially designed for hulling cereals, such as maize and Indian corn, without danger of breaking or crushing the grains. In order to accomplish the result use is made of a revoluble vessel adapted to contain the cereal to be hulled, a plunger arranged eccentrically within the vessel and having both an up and down and a turning motion and coacting with the side of the vessel, and a revoluble rubbing and agitating means arranged centrally within the vessel, coacting with the plunger.

ROTARY PUMP.—G. BEY, 61 Gautier Ave., Jersey City, N. J. This invention has for an object the provision of construction in which leakage is prevented by use of gaskets without in any way retarding the proper operation of the piston. Another object is to provide a pump having a rotary piston alternately discharging and drawing in liquid at the opposite ends of the structure, and to form a rotary pump in such a manner that the casing, piston and associated parts form a valve mechanism automatically, whereby extra valves are not required to prevent any back flow of the material being pumped.

Medical Devices

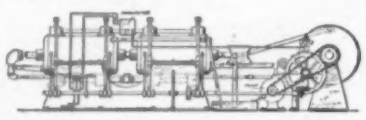
AMBULANCE STRETCHER.—E. CHASSAING, Paris, France. An object of this invention is to provide a stretcher the flexible fabric of which can be easily and quickly detached from the poles without disturbing a wounded person resting thereon. Another object of the invention is to adapt this stretcher to existing types of stretchers. The device comprises a fabric with flexible beading in each hem, and a slotted socket on each pole to receive the hem of the fabric and the bead.

Musical Devices

AUTOMATIC STOP FOR PHONOGRAPHS.—A. C. HENDRICKS, Martinsburg, W. Va. This invention relates generally to automatic stops for phonographs and more particularly to improvements in connection with the apparatus for this purpose described in patent No. 1,256,319 granted to the same inventor, the object of the improvements being to simplify the construction, and to obtain substantially similar results with less trouble and materially reduced expense.

Prime Movers and Their Accessories

INTERNAL COMBUSTION ENGINE.—L. B. JOYNER, St. Cloud, Minn. The invention relates more particularly to engines of a type in which the piston is subjected to explosions upon



A SIDE ELEVATION OF THE ENGINE

both sides thereof, occurring in the opposite ends of its cylinder, the primary object being to provide means whereby this particular type of engine may be rendered effective and practicable, and utilized to efficiently perform the several functions, and in the several instances for which the usual type of engine is employed.

ACTUATING AND REVERSING MECHANISM FOR PUMPS.—J.P. ULDERUP, 126 Sickles Ave., New Rochelle, N. Y. This invention relates to internal combustion engines using liquid fuel for the motive agent, its object is to provide actuating and reversing mechanism for the pump to insure an accurate functioning of the pump for the latter to deliver liquid fuel to the working chamber of the engine, and arranged to permit convenient reversing of the engine whenever it is desired. Another object is to use the actuating and reversing mechanism for maintaining a uniform speed of the engine.

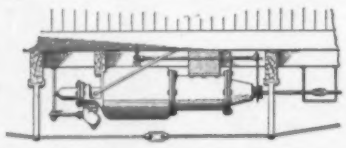
MOTOR.—J. SCHROEDER, 1624 W. 6th St., Davenport, Iowa. The invention has reference more particularly to the control of the motive fluid. An object is to provide a simple and efficient motive fluid control for a reciprocating engine of a character such as to eliminate motion-transmission means and the flywheel used in connection with the motor, as shown in patent No. 908,890 granted to the same inventor.

ROTARY MOTOR.—T. T. LOVELACE, 67 Main St., Keyport, N. J. The invention relates to the type of rotary motors having a plurality of cylinders with their axes parallel to each other and revolving bodily around a common axis at a right angle to the plane of rotation of the cylinders. The object is to provide a motor which permits the use of a large number of cylinders in a compact form and capable of developing high power at the same time reducing head resistance to a minimum thus rendering the motor particularly servicable for aviation or other purposes.

PROCESS FOR PREVENTING CARBON IN ENGINE CYLINDERS.—W. R. HARTUNG, Connell, Wash. This invention relates to a process for preventing carbon deposits in engine cylinders, more particularly in internal combustion engines used on automobiles trucks, and similar motor vehicles. An object is to provide a process which does not necessitate the use of chemical carbon removers or the use of steam. A further object is not only to prevent deposits but to actually add to the life of the engine. By this process the interior of the engine cylinder and piston head are chilled so as to produce a hard glazed surface.

Railways and Their Accessories

ATTACHMENT FOR AIR BRAKES.—F. T. SHAW and J. G. MEADOR, JR., Winchester, Miss. The object of the invention is to provide means in connection with the relief valve of the air brake cylinder for holding the relief valve open when it has been opened until the piston moves



A SIDE VIEW OF THE BRAKE MECHANISM PROVIDED WITH THE INVENTION

into release position, the releasing of the valve being controlled by the piston. A spring controlled latch is provided for holding the valve open, this latch is normally pressed into engaging position by a coil spring which encircles the rod of which the latch forms a part, between the casing and a stop on the rod.

Pertaining to Recreation

MECHANICAL TOY.—I. N. WEBER, 575 West End Ave., New York, N. Y. Among the objects is to provide a toy calculated to afford unusual attractiveness because of its patriotic aspect, the apparatus including a movable figure that may represent in caricature a popular, but much hated, alien enemy, the figure being so poised in the apparatus as to be struck and knocked over by a projectile in the nature of an allied soldier.

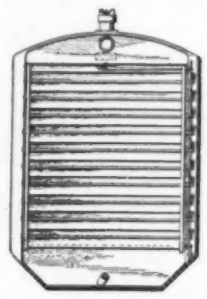
TOY.—O. E. WALL, Honolulu, Territory of Hawaii. The invention relates to a toy in the form of a ship having mounted thereon a number of guns for firing projectiles, with means for actuating the guns successively to fire the projectiles one after the other. A further object is to provide a device which is of a very simple nature, consists of few parts, and not easily liable to be put out of order.

Pertaining to Vehicles

ATTACHMENT FOR WIND SHIELDS.—A. KATZENSTEIN, Shreveport, La. The invention has for its object to provide an attachment adapted to be arranged in front of the wind shield consisting of a frame having a filling of perforate material, for preventing the passage of insects and the like, which will render the night driving of an automobile or other vehicle possible without the use of goggles or eye shields.

METER.—M. SMITHEY, Lawrenceville, Va. This invention has for its object to provide a device adapted for use with motor vehicles wherein a combined speed indicator and a series of odometers is provided, the odometers being mounted on a rotatable support to move with the support, and operating mechanism is provided within the support for actuating the odometers in succession, the support being arranged to be rotated at regular intervals, to bring the odometers to reading position, mechanism is also provided for throwing the odometers out of operation and resetting them.

TEMPERATURE REGULATING SYSTEM.—H. S. COY, 1116 W. 8th St., Anderson, Ind. The invention relates to the temperature regulating system for radiators, wherein shutters are arranged for preventing the passage of air past the cooling pipes, and wherein temperature con-



A REAR VIEW OF RADIATOR PROVIDED WITH THE DEVICE

trolled means controlled by the temperature of the water in the radiator is provided for opening and closing the shutters in accordance with the temperature of the water, and wherein indicating mechanism is provided for indicating the temperature of the water.

TRACTOR.—W. R. KEMPSTER, Whiteside County, Ill. The object of this invention is to provide mechanism in connection with tractor wheels in the form of studs which may be extended beyond the periphery of the wheel or may be withdrawn within the periphery of the wheel, to assist the wheel in gripping the ground.

VEHICLE TOP.—D. F. OLIVER, Dec'd, address, D. F. Oliver, 2610 East 14th St., East Oakland, Cal. The invention has for its object to provide a vehicle top more especially designed for use on standard bodies of automobiles, and arranged to keep the cover properly stretched under different weather conditions, and to permit the operator to easily and quickly raise or lower the top or extend the rear portion only, while the front part is folded to be out of the way of the occupants of the vehicle.

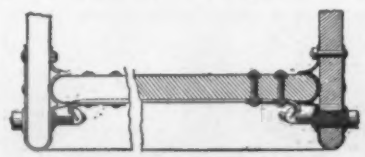
DEMOUNTABLE RIM.—C. R. RAGSDALE, 814 Maisson Blanche Bldg., New Orleans, La. The invention relates to wheels having interchangeable pneumatic tires and has particular reference to reliable and easily operated means for the interchange of the tire supporting rims. A further object is to provide a demountable rim construction for wheels in which no bolts, nuts, or wedges are required to hold the tire supporting rim on the felly or felly rim.

GEAR SHIFTING DEVICE.—G. E. COOK, 1417 36th St., Brooklyn, N. Y. The invention relates to automobile gear sets of the selective type, its object is to provide a gear shifting device more especially designed for use in the power transmission of automobiles, auto trucks, and other power driven vehicles, and arranged to enable the driver to readily change the speed or reverse selectively as needed at the time without first shifting to any other speed.

CHANGE SPEED GEARING.—W. S. IREY, Pampanya, Philippine Islands. The invention relates to a device for changing speed in running an automobile without the use of hand levers. It is also intended to do away with the necessity of using the hands in effecting speed changes other than those brought about by throttle and spark control, thereby giving the driver the full use of his hands at the steering wheel and its appurtenances for throttle and spark control. This is effected by an easily managed foot control.

A second invention granted to the same inventor relates to means for automatically returning a shift member from a set position to neutral position when another lever is operated to change the speed, thereby preventing the "killing" of the engine by the locking of the speed change gearing internally.

END GATE FASTENER.—L. P. WELLS, Gering, Neb. An object of the invention is to provide an end gate fastener including as one of the important features, a combined sheath for the ends of the sides of the wagon body and cleats

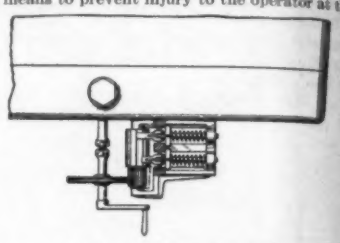


END GATE IN PLACE SHOWING FASTENER

receiving the ends of the end gate, together with means for clamping the end gate in position. Another object is to so arrange the cleats and the clamping means, that the end gate may be held in various elevated positions as in unloading grain, without entirely removing the end gate.

TRAILER.—L. WATKINS, 414 Missouri St., San Francisco, Cal. This invention relates to means which will allow an easy turning movement where a number of trailers are connected while admitting of strain between the various trailers whereby they are properly propelled around a curve. Another object is to provide a construction wherein both axles of the tractor are held in position by a king pin and parts are connected with the axle and with the draft member for turning the axle in different directions when turning a corner so as to cause the wheels to properly follow or track.

SAFETY ATTACHMENT FOR GAS ENGINE CRANKS.—M. J. REILLY, 483 Broadway, New York, N. Y. The invention relates to cranking devices for automobiles or other internal combustion engines and has particular reference to means to prevent injury to the operator at the

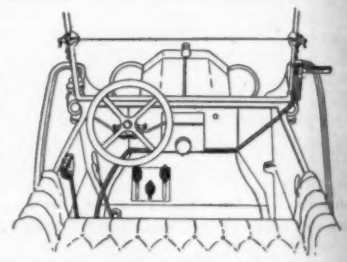


A PLAN VIEW OF THE DEVICE

time of the cranking operation, due to premature ignition or back-firing of the engine. Another object is to provide an attachment adapted to be readily applied to existing engines without material alteration of the structure of such engines.

TRUCK WINDLASS.—H. F. SHEPHAM, 385 Stone St., Brooklyn, N. Y. Among the principal objects of the invention are to provide a windlass mechanism removably mounted on a truck body, and to save space required for permanent mechanism of this character. The device is mounted on bearing blocks bolted to upright framing bars, there are standards having tenons adapted to fit in sockets in the floor of the truck, the device is made fast by hooks to a retaining bar which is incorporated in the structure of the truck, and the frame is prevented from lifting to disengage the tenon.

SIGNALING DEVICE.—G. P. WAHLE, New Albany, Ind. The invention has for its object to provide a device especially adapted for use with motor vehicles, wherein a series of semaphore arms is provided, mounted to swing into and out of a supporting casing, the arms having means for

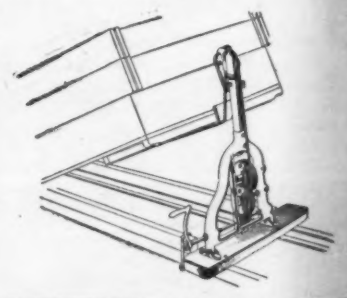


FRONT PORTION OF MOTOR FITTED WITH DEVICE

swinging independently of each other, and means for holding the arms in operative position and a common releasing means being provided for all the arms; for night use the signal is illuminated by electric lights.

TRACTOR TRAIN.—T. M. MCDONALD, R2, Ronan, Mont. The invention relates to an automobile train adapted to be propelled over ice or through water, although not limited to this alone, the units in the train having bouyant bodies. An object is to provide an automobile train having a pilot unit, a motor unit, and trailer units, for passengers or merchandise, the motor unit being arranged to independently drive the pilot unit and trailers in order that the respective drive wheels may be driven at different speeds when desired, as for instance in causing the pilot to mount an ice field from the water.

BODY HOIST.—K. W. GILLESPIE, Lincoln, Neb. The invention relates more particularly to hoists for the bodies of dumping wagons, the object being the provision of a structure, the



A PERSPECTIVE VIEW, ILLUSTRATING APPLICATION OF DEVICE

operating parts of which follow the movement of the wagon body, provide for more effective operation, and combine to form a simple economical structure which will at the same time be very strong and durable in use.

Designs

DESIGN FOR A LOCKET, FOB, OR SIMILAR ARTICLE.—C. MITRANO, 59 Second Place Brooklyn, N. Y.

DESIGN FOR A WATCH CASE.—B. GLAPMAN, care of Burnstine and Lesser, 132 Nassau St., New York, N. Y.

DESIGN FOR A DOLL.—LELIA M. FELLOW, 216 Grosse Bldg., Los Angeles, Cal.

DESIGN FOR A NON-SKID TIRE.—G. F. ARMSTRONG, care of Armstrong Rubber Co., Garfield, N. J.

Improving the Port of New York

THE dock facilities of the Port of New York do not represent a broad, well thought-out plan; on the contrary, they have grown up in response to the ever pressing demands for increasing dock and warehouse facilities, due to the growth of New York during the past century to its present position as the leading port of the New World. Development of this kind is necessarily spasmodic, and in a city that is under political control, this development from administration to administration is destined to be fragmentary and lacking in coördination.

The present Director of the Port of New York, Murray Hurlbert, has made a study of present conditions and has drawn up a plan for their betterment. His recommendations are contained in a report which has secured the endorsement of Secretary Redfield of the Department of Commerce, and particularly as regards that part of the plan which forms the subject of illustration on the front page of this issue. This plan relates to the removal of the Sound steamers from their present piers on the North River to a series of piers on the East River, in the neughborhood of the present 23d Street Ferry, which piers will be reconstructed for the accommodation of the very important Sound steamer traffic.

The leading position held by the Port of New York is shown by the fact that in 1917 the value of the total imports of the United States was $2,659,000,000, of which $1,338,000,000, or 50.32 per cent, passed through this Port. During the same period, the value of the total exports of the United States was $6,290,000,000, of which $3,053,000,000 or 45.53 per cent, passed through the Port of New York.

In proof of the severe handicap under which the city labors as the result of its cramped and inadequate facilities, it should be noted that during the year 1917, the Port of New York made a gain of only five per cent in its export trade, while Philadelphia increased more than 50 per cent, Baltimore 30 per cent, and Boston 27 per cent. Moreover, the United States Shipping Board recommended that trade be diverted to South Atlantic and Gulf ports because of the inadequate facilities at this Port. In the judgment of the Director of the Port, a readjustment of conditions will be required after the war, which will practically necessitate zoning of the Port for water trnasportation.

In establishing the proposed East River terminals for the Sound steamers, it is shown that certain improvements of the East River channel will be necessary, such as widening and deepening to 40 feet of the Hell Gate channel, and the removal of what is known as Shell Reef, which extends from Grand Street to 30th Street, and at 10th Street projects nearly to the center of the East River. The River and Harbor Act of August 8th, 1917, authorized the removal of this reef, but up to the present time no appropriation has been made for the purpose. The reef limits the usefulness of 16 piers in the East River by preventing vessels of deep draft from gaining access to them.

The predisposing motive of the suggestions of the Director of the Port is the urgent necessity of providing additional accommodation on the Manhattan side of the North River for ships engaged in overseas service. To this end, he recommended some time ago the transfer of the Sound steamers from Piers 14, 15, 18, 19 and 40 North River, to 18th, 19th, 20th, 21st, 25th and 26th Streets on the East River. The considerations which render this change desirable may be given categorically as follows.

"1. The five piers mentioned in the North River can accommodate ships drawing up to thirty feet, whereas the Sound liners now sailing from these piers only draw from 17.5 to 19.3 feet.

"2. The Sound steamers can readily be accommodated at the piers between 17th and 26th Streets, East River, the slips of which are, in fact, wider than those at present occupied by them, but the existence of Shell Reef prevents the use of these piers by steamers of greater draft.

"3. The removal of the Sound steamers, by eliminating the trip around the Battery, would tremendously relieve congestion at that point, and between the Battery and the Navy Yard, as well as in the North River.

"4. Inasmuch as the freight carried by the Sound steamers is principally handled by dray or motor truck, it would also greatly relieve congestion in West Street, and would at the same time make effective the use of the marginal street extending from 17th Street to 23d Street, which now carries little traffic.

"5. Removing the Sound steamers to the East River would save at least 60 miles of useless navigation a day, or more than 18,000 miles per annum, and consequently a saving in the consumption of coal.

"6. The removal of the Sound steamers to the piers mentioned in the East River would create a Sound steamship terminal, and these piers have direct transportation service with the 23d Street cross-town line, which connects with the Second, Third, Sixth and Ninth Avenue elevated railroads; Lexington Avenue, Brooklyn Rapid Transit and the Seventh Avenue subways; the McAdoo tunnel, the Pennsylvania and Grand Central terminals and the uptown ferry terminals of the railroads that do not connect with the Hudson tunnel."

Substantial improvements will have to be made on these piers, the most important of which will be the erection of one-story steel frame sheds at a cost of about $95,000 each.

The Minerals Act

IT will be strange to some to hear that we have hitherto neglected to develop a large and important part of our own natural resources. Strange it may be but it is true. We have been content to buy from others raw materials which we had in our own possession but which for one or another reason we have not chosen to develop. Thus we have been dependent upon importations from other nations of essential articles which we could produce ourselves but either did not produce at all or produced in quantities not sufficient for our purpose. Among these materials are such well-known substances as chromium, graphite, manganese, potash, tungsten and many more.

The war has taught us the danger of being dependent upon foreign sources of supply for any essential articles that we can produce ourselves and all of the articles and many more in the same category are essential. We cannot get along without them. Since the war began necessity has led us to undertake with some measure of success the development of our own resources of these needed things. Our output of potash, manganese, etc., has greatly increased. It is, however, far from sufficient.

The necessity for a further development of these resources at a time when current conditions made such development by private means all but impossible has led to the passage of what is known as the Minerals Act which received the Executive approval on October 5th last. This makes provision for an adequate and increased supply of certain mineral substances which are named and provides authority for making contracts for producing or purchasing same and for developing and operating mines, deposits or plants necessary to increase the production of these needed goods. The sum of $50,000,000 is provided as a revolving fund and a corporation is authorized to carry out the powers granted in the Bill.

By this means it is hoped, under the direction of the Department of the Interior through its important scientific services—the Bureau of Mines and the Geological Survey—to make ourselves more independent in the future than in the past we have been.

It is hardly necessary to point out the importance of this as a forward step in laying a broader and sounder basis than has heretofore existed for the commerce and industry of the country.

Whale Meat Approved by the American Public

(Continued from page 388)

go without meat because of the cost.

The whale, unlike most other mammals, presents a neckless appearance, but he has the same seven neck bones that humans and all mammals use. The cervical vertebrae are closely compressed together, exceedingly thin and most of them united. The whale, in fact, represents first mammals, of rudimental stage of development. The whales are the largest animals that ever inhabited earth, but unlike other huge animals that formerly roamed on land or sea, they survived various terrible convulsions which destroyed their contemporaries, by taking refuge in ocean abysses. Semi-amphibious, they resemble fishes more than land mammals, but only outwardly. They have the same oval outline of fish, same compact form of trunk, which is united with the head without an intervening neck. They have the same fin-like organs of propulsion, the expanded

and prolonged tail being the chief organ of motion. Unlike fishes, they breathe only air of the atmosphere above them. Necessity compels them to rise frequently to the surface for air. With lungs full of air, their bodies have buoyancy, enabling them to do without the swim bladder of fish. They diminish their specific gravity by oily fluid collected under the skin. The oily fluid reservoir at the top of the head, makes for elevation of the spiracle, or orifice of the nostrils to the surface of the water. Unlike a fish, the whale tail is compressed laterally, and while inflected from side to side as in fish, is flattened horizontally, and strikes the water vertically. This makes for ready diving or swift rise to the surface. It also makes it hot for whaling long boats and whalers in the vicinity of the whale tail propeller.

The whale has the same vertebrae, or spinal column and its immediate dependencies, same skull, lengthened tail and ribs as land mammals. The trunk, or throax, is located well forward so the tail can work freely and to allow full play of muscles in action. The dorsal and lumbar vertebrae are expanded to give the animal breadth of body, also assisting muscular display. Being situated horizontally, they offer no impediment to the vertical flexure of the spine. While the whale has no hind limbs, the rudimentary bones are there, laid on the shelf, as it were, as a reminder of other days and forefathers. The fin-like paddles take the place of the hands of humans and have the same bones.

Dr. Roy Chapman Andrews of the American Museum of Natural History thus describes the commercial preparation of the whale in his work on "Whale Hunting With the Camera":

"The whales are handled in such an unusual way in Japan that there was much to learn about the industry itself. The stations are usually situated not far from the feeding grounds of the animals, in or near one of the little fishing villages that dot the coast in every bay and harbor. Eight or ten large wooden buildings compose the factory, and there is always a long wharf projecting into deep water, at the end of which stand upright a pair of long, heavy poles inclined forward and joined at their extremities by a massive crosspiece: from this are suspended the blocks through which run wire cables from the steam winch.

"In some instances, whales are drawn out upon the slip in the Norwegian way, but the more usual Japanese method is a modification of that used by deep sea whalers; the animals are cut while lying in the water, the poles at the end of the wharf being substituted for the masts of a ship.

"Few people realize the great part which whale meat plays in the life of the ordinary Japanese. Too poor to buy beef, their diet would include little but rice, fish and vegetables, were it not for the great supply of flesh and blubber furnished by the huge water mammals. In winter, if there is little fish to be had, the meat of the humpback whale, which is most highly esteemed, sometimes brings as much as fifteen cents per pound; but this is very unusual and ordinarily it can be bought for seven cents or less. The edible portions for ordinary Japanese are not only the flesh and blubber, but the heart, liver, tongue, intestines, and other parts of the viscera. What remains is first tried out to extract the oil, then chipped by means of hand knives and dried in the sun for fertilizer.

"Whale meat is coarse grained and tastes something like venison, but has a flavor peculiarly its own. I have eaten it many days in succession and found it both palatable and healthful. In fact, a chemical analysis shows it to contain about 98 per cent of digestible material, whereas ordinary beef has seldom more than 93 per cent. In summer, when it is impossible to ship the meat long distances for want of ice, much of it is canned. The flesh is cooked in great kettles and the cans made, packed and labeled at the stations, and shipped to all parts of the empire. The Japanese convert the baleen of fin whales, formerly of no value, into cigar and cigarette cases, charcoal baskets, sandals and other beautiful and useful objects."

War and Discovery

(Continued from page 391)

old list of the same old necessities. There's little that's new in this war, much less the traitors, carpers, and critics. In the last analysis, war is an exact science only on paper, or in training camps; in the field, face to face with the enemy, strength of purpose, of legs and arms still decide the fate of many a battle. Victory, the jade, still loves man-power.

So, while American inventors are sticking their heads among the clouds, cogitating revolutionary things, it will pay them to keep their feet on the ground. The Teuton military inventors are of the earth. They did not invent the locomotive, the steamship, the telegraph, the telephone, the electric light, the submarine, the wireless, the automobile. the airplane, the automatic gun, the explosive shell, posion gas, the flame squirter, the hand bomb, barbed wire, the tank. They adopted them, and many other things they are using. Their originality is negligible. Americans surely ought to be original in adaptation, having been so original in creation. The Teutons' most shocking surprises are as old as some sins.

What are many American inventors thinking of? Everything; and of certain things in particular. From a limited investigation these few are culled. Naturally, thousands think alike, invent the same levices, for which we have to thank our schools, our periodicals, our books of reference. Naturally, too, the submarine comes in for particular attention. Many believe that a periscope may be blinded, by spreading a heavy oil in the wake of a fleeing ship; then inflammable oil may be dropped during pursuit, to be ignited by an incendiary shell when the submarine shall have arrived in the oil zone. Others propose that bombs be dropped behind, chained or wired together, so as to line up at right angles to the submarine's course, and to explode by contact. The idea is, that if a string of bombs could be laid for a thousand feet or more, the submarine would be wrecked no matter where it encountered the line. The magnetic depth bomb, to attach to vessels, and to explode by variation of submergence only, is also a popular subject for reflection. The idea of firing inflammable shells—rather inflammable chemicals in shells—is a good one. Few who think out these schemes have the means actually to try out experiments.

The plan of magnifying sound waves has many adherents. It is reminiscent of secondary-school textbooks of physics. It is treading on the heels of the megaphone or lighthouse siren, by way of the resonator. Each thinker may be on about 6 P. M. of the eve of a great discovery, still the chances are against one pound of mechanical energy being converted into one ton for warlike purposes. It is proposed to cause air waves to form in a chamber, and be expelled into the atmosphere, or beneath the water, so potently magnified that an ordinary thin-skinned submarine or a field trench would be uninhabitable by reason of the terrific vibrations. There is more "science" about this than in the ramming machines which are designed to use the hydraulic press for the purpose of destroying trenches in a leisurely manner. It would be necessary with this scheme, first to catch your Teuton; second, to hold him; third, to defend yourself while giving him the grand squeeze.

A number of "annihilators," so-called, hark back to Clerk Maxwell. By use of a 25-cent dry cell, some sort of a fabulous Marconigram is to be fabricated, and sent eastward through the ether, presumably to shock the enemy to his senses, after which, the war being over, he could turn to farming and to feeding his folks. Indeed, the activation of energy through the ether of space, and the disintegration of radioactive substances, are peculiarly attractive to well-read inventors. To be sure, the application of a capital discovery in either field might end the war in a week. That is why it is so seductive. If enemy explosives could be blown up by "wireless," using Greek letter rays, or what-not; or if a vial of radium, after being conveyed several hundred miles into enemy territory, could be disintegrated in an instant—that is, if the normal disintegration of 2,000 years could be instantly accomplished—something might happen for a certitude.

The applications of the usual to the grandiose attract thousands, undoubtedly. The tank gave impetus to plans for enormous armored tricycles, having wheels not short of one hundred feet in diameter, able to crush houses, and to ride over trenches and forest almost at will. These sound astounding, but are really practical so far as construction is concerned. So, too, gigantic airplanes are practical in themselves, yet the element of time renders most huge machines impractical. It might well require several years to design, perfect, and build the machines, and much time to train operating crews.

The unheard of cruelty of some of the

things the inventors are meditating upon is appalling. Hydrocyanic acid shells, fumes, and squirters, are common. The poisons have been flayed in search of hideous forms of death. Shells to fright Teutons for years to come are even thought of: shells designed to bury themselves in the ground when dropped from airplanes, and to explode in one, five, or ten years afterward. There is nothing impossible about these weird devices, excepting that civilized America cannot tarnish her good name by using them.

The improvement of shells is chiefly along the old plans of successive explosions within the gun or the shell itself during flight. Many pin faith in a system of nested shells each carrying a propellant charge, except the innermost, which also carries the explosive proper. Each shell, therefore, would be an outer shell during part of the flight; and each outer shell, when near exhaustion of its range, would discharge the dwindling nest, and fall. The gyroscopic control would have to be exceedingly elaborate, delicate, and accurate. This system could not supplant airplane bombing, nor the making of larger guns. The impersonally conducted shell by automatic airplane, is another favorite suggestion for getting high charges over into the enemy's country.

There are a legion of electrocuting schemes, perfectly feasible if the enemy would only remain passive while the machinery was being installed. Every one will have heard of many death-dealing proposals, many blood-curdling terrors.

Who are these thinkers? Not all of them are of the type of man who rose one fair morning resolved forthwith to serve his country. After breakfasting, he dusted off his one volume of Natural Philosophy; by noon he discovered what his author had neglected to apply to war; by evening his letter on Mechanics as Applied to War was speeding eastward. Most of these thinkers are living and working near us. In lieu of training, they have enthusiasm. War, which inhibits the favorable working conditions for master workmen, may stimulate some one or more of these students to give America mechanical, chemical, electrical ascendency.

It may evidence our ingeniousness, but as democrats we like to expect fine arts from our neighbors, and great achievements from common men. We confess, all of us, we should like to wake up some morning and hear some friend was famous; for in democracries, genius abides with simple folk. That is our faith. Here's hoping some fellow vindicates it.

In the Service of the Guns

(Continued from page 393)

allowed to drop behind if any labors on the part of instructors can make him keep up.

All this can have but one result. And it is a complete answer to that mightiest of puzzles which is afflicting the German High Command. Every one remembers their remarks about the "contemptible little army" of England, and the world knows how "the contemptibles" have "come through." Every one knows, too, the assurances given the German people that it was impossible for America to train soldiers in time, and that no matter how many we sent overseas, they could never stand against trained troops. Germany, who has spent years in training her officers and her specialists, especially her artillerymen, knew well what a long and arduous job it was. But Germany failed to take into account the enormous capacity for adaptability of the American mind. Even we who should know it may have had some doubts that in three months a man could be taught to be a master gunner, a radio electrician, a sergeant major, or an artillery officer.

Nor could it have been done with the old system of schooling. But with this new and modern idea of intensive training—with every minute a working minute, with courses so arranged that variety of work keeps up interest and prevents mental weariness, with the urge of enthusiasm and the practical certainty of overseas work, important work, fighting work as a reward, we have done it—and Germany has learned to her cost that the United States soldiers, from their officers down to the humblest privates, *can* be trained in a hurry and still trained efficiently.

No training schools in the country have done or are doing more to uphold this reputation for quickly turning the civilian into the expert soldier that the Enlisted Specialists schools at Ft. Monroe, which is largely why the big guns and the big gun crews of the American Expeditionary Force do not need to blush for their prowess or require any apologies from the infantry whose advance they make possible or protect.

The courses not only offer opportunities for men in the draft, for men in deferred classifications who desire some more extensive service than they might get by waiving classification and going where they were sent, but also present chances for the man who is turned down for some slight physical defect. No man who wants to serve and who is refused for what he himself knows to be a physical reason which does not interfere with his life to any extent, should rest satisfied to remain out of the service until he has applied at these schools. It should not be understood that the schools are looking for men less than physically perfect, but that there may be an opportunity for limited service men which offers much in attractiveness beyond those chances ordinarily held out to those so handicapped.

Full information can be had by addressing Enlisted Specialists Schools, Ft. Monroe, Old Point Comfort, Va.

A New German Drying Process

THE so-called Krayseska method, a new means of drying fruit juice, blood and eggs, has been demonstrated before the food authorities of Berlin, and been found worth exploiting to a large extent; it is announced that plants of this type for treating about 140,000 eggs a day will shortly be erected in Berlin and Bucharest.

The drying is done in a large iron cylinder five meters in diameter, in which a pair of big metal wings rotate rapidly, driven by a steam turbine. The fluid is lashed to foam, and dried by a current of hot air that is continually passing through the cylinder. The dried products go through no chemical change, and are directly soluble in water. They are in the form of a powder, which will keep for a long time and can of course be transported with great economy. It may be suggested that, if Germany's food resources are as near their end as is sometimes represented, the opportunity for organized chicanery presented by this process is one good reason for its adoption. From the Teutonic official point of view, it might be a great boon to be able to dole out a nondescript disintegrated mass to the starving populace, with the bold assurance that it represents eggs or beef-juice. Perhaps the introduction of sawdust and moss into omelet and soup would actually result in a smaller proportion of these wholesome ingredients in the daily bread.

Why Eggs Should Not Be Washed

GROCERS receiving eggs they expect to keep on hand any length of time should not wash them, even if they are dirty. The dirt is wholly on the outside, and only affects the appearance of the egg. The shell of an egg contains a gelatinous substance which prevents air and germs from entering the eggs. Washing destroys this substance.

Many customers will not buy soiled eggs, but it is desirable that the grocer should explain these facts to his patrons. The public has been trained to demand and buy clean eggs. It should be remembered that dirty eggs, while not pleasing to the eye, are often the best. According to the Department of Agriculture, more than five million eggs spoil unnecessarily in cold storage every year because they have been washed or have in some way become wet before being sent to market.

Natural Cement of the Greeks

THE use of cement for making blocks in Greece and the neighboring territories is generally found somewhat expensive, for cement is imported in barrels or bags from France or England; but the volcanic island of Santorini, in the Aegean Sea, produces a natural cement called "Portselana," which mixed in certain proportions with lime and sand is an excellent substitute for the best cement.

Portselana has been used for many centuries and is still being used throughout the Near East, in the construction of bridges, harbor works, breakwaters, forts, lighthouses, etc., in the Mediterranean, the Black Sea, and the Adriatic. With it the Venetians constructed the great fort of Monemvasia and Naupli, the then Gibraltar of the western Mediterranean, the foundations of which are in the sea, intact and immovable up to now after many centuries, according to the *Near East*. The forts of Crete and those of the Dardanelles are also built with Portselana. Small sailing ships are doing a continuous trade with loads of Portselana to all the Mediterranean and Black Sea coast.

NEW BOOKS, ETC.

AUDITING PROCEDURE. By William B. Castenhoitz, A. M., C. P. A. Chicago: La Salle Extension University, 1918. 8vo.: 352 pp. Price, $3.50.

An expert here covers in excellent style the best procedure in auditing of all kinds. Without attempting to cope in detail with the accounting problems of special types of organization, it furnishes general information as to practice that may readily be applied or adapted by the student to nearly all cases, following the accepted forms of balance sheet and profit and loss statement construction. Particular attention is paid to the audit of balance sheet accounts and income and expense accounts, and some of the special features pertaining to the examination of such types of organization as public service companies, railroads and financial institutions are helpfully presented.

THE SUBMARINE IN WAR AND PEACE. By Simon Lake, M.I.N.A. Phildelphia and London: J. B. Lippincott Company, 1918. 8vo.; 314 pp.; 71 illustrations. Price, $3 net.

The author has had no small part in making Jules Verne's inspired dream of under-sea navigation come true. In this excellent and most attractive volume he gives freely of his own arduously-acquired knowledge. From his simple explanations we learn the vital parts and principles of the submarine; the comedy and tragedy of its development, the experiences of pioneer inventors, and the evolution of the submarine to its present commanding position, are discussed in a masterly way, the possibility of defeating its tactics is canvassed, and there follows a chapter of prophecy as to its use in peace. The many admirable full-page plates add greatly to the interest of the volume, and there is a chart illustrating the comparative visibility and comparative safety of surface ships and cargo-carrying submarines.

ACCOUNTING AND COSTS. New York and London: A. W. Shaw Company, 1918. 8vo.; 244 pp.; illustrated. Price, $3.

The bank of today knows to its cost what profit leaks are, and the difficulty of wresting profit from the individual account. An efficient cost system is indispensable to successful banking. This meritorious work tells what such a system will disclose, how it can be made to fit special needs, how to charge for services, how to determine the item cost; after finding costs comes the expedients for cutting them, and the second part of the work presents solutions by way of the mail system, careful buying, simplifying tellers' work, and using machinery to the best advantage.

THE FUNDAMENTAL EQUATIONS OF DYNAMICS AND ITS MAIN COORDINATE SYSTEMS VECTORIALLY TREATED AND ILLUSTRATED FROM RIGID DYNAMICS. By Frederick Slate. Berkeley: University of California Press 1918. 8vo.; 243 pp.

The author, disclaiming systematic conception for this work, "is content with a circling return from one point to another to a core of ideas that are worth reviewing in their various aspects because they are central." His chapters form a needed supplement to standard and more dogmatic works in that they emphasize considerations usually neglected by such works; they show, and inculcate, independent thought, and are the mature fruit of research among both origins and generalizations. The introductory summary is a well-directed effort to reconcile prospect and retrospect and clear the way for the discussion that follows.

STOICHIOMETRY. By Sidney Young, D.Sc., F.R.S. New York and London: Longmans, Green and Co., 1918. 8vo.; 377 pp.; 93 figures. Price, $3.75 net.

In the difficult process of determining the relative atomic weights of hydrogen and oxygen, chemists rely on physico-chemical investigations of properties rather than on purely chemical determination of the equivalent of oxygen: so this work precedes methods of determining atomic weights by a detailed account of the properties of gases. This second edition has provided an opportunity of re-writing several sections and incorporating much new material; it takes account of the adoption of a lower value for the atomic weight of silver, of modern views on the nature of atoms and recent research on the radio-elements, and of American investigations into osmotic pressure.

LESSONS IN PERSONAL EFFICIENCY. By Robert Grimshaw. New York: The Macmillan Company, 1918. 8vo.; 218 pp.; illustrated. Price, $1.50.

No man can attain efficiency without possessing, consciously or unconsciously, a knowledge of certain principles; if these are consciously studied and applied, rapid progress is assured. Dr. Grimshaw takes up, one by one, such subjects as perception, attention, fatigue, habit, memory, and the will, and in terse and pointed style, with humorous and apt illustrations and analogies, he shows the reader exactly how to live and work with the least possible friction, directing his energies into the straight path that conducts to success and a strong character.

SUNSHINE AND AWKWARDNESS. By Strickland Gillilan. Chicago: Forbes and Company, 1918. 8vo.; 111 pp. Price, $1.

Here is a lecture that Gillilan has been giving for laughing purposes for many years; it meanders across various obstructions from twins to railroad wrecks; but however sinuous these meanderings of the stream of humor it is always close to human nature, and provides a good antidote to the poison of pessimism.

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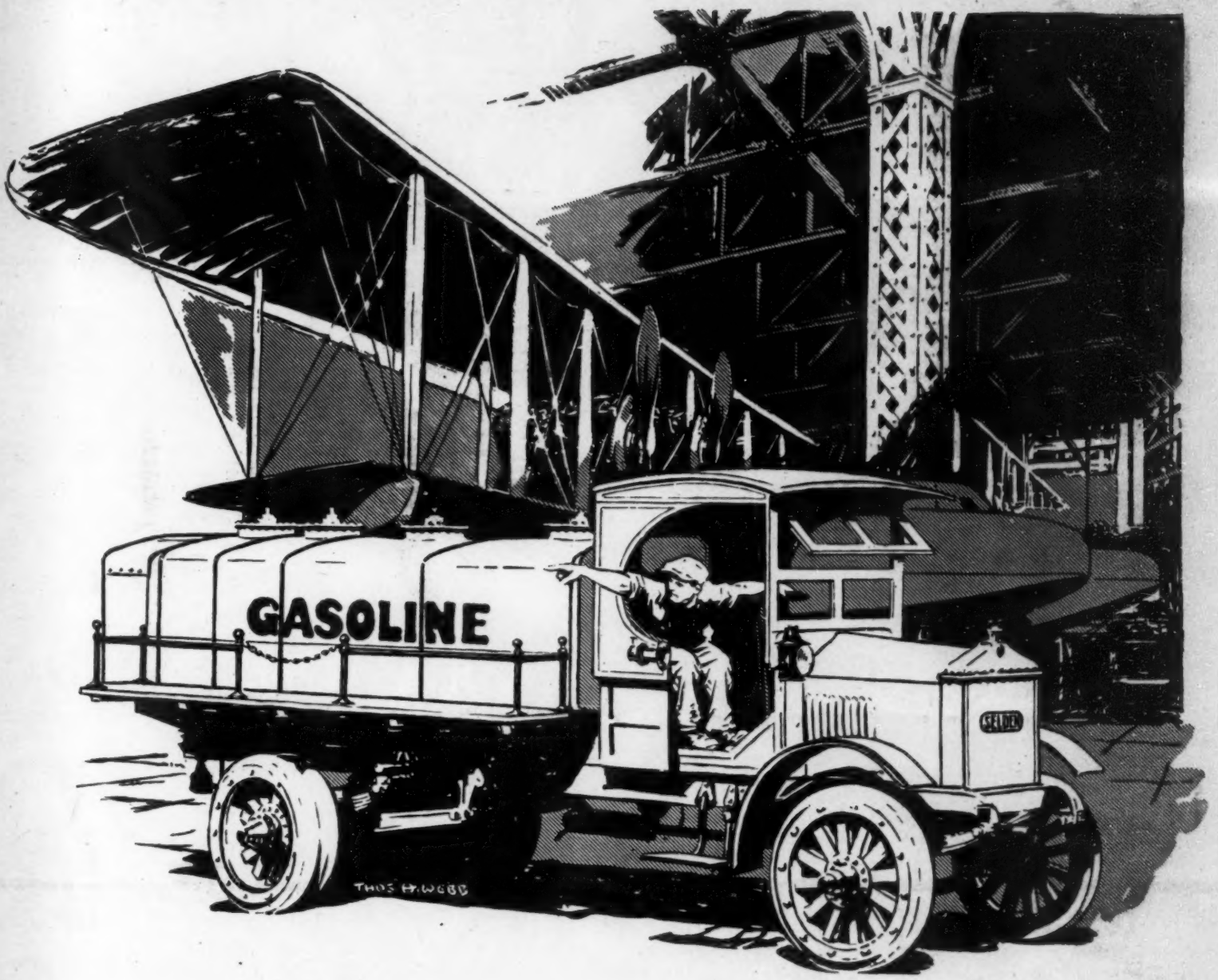

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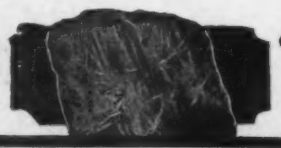
through **Asbestos**  *and its allied products*

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